

**Review of the 2007 Lower Cook Inlet Area
Commercial Salmon Fishery, Personal Use Coho
Salmon Gillnet Fishery, and Salmon Enhancement
Programs, and an Overview of the Lower Cook Inlet
Area Herring Fishery/Stock Status**

by

Lee F. Hammarstrom,

Ethan G. Ford,

and

Edward O. Otis

November 2007

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)		General		Measures (fisheries)	
centimeter	cm	Alaska Administrative		fork length	FL
deciliter	dL	Code	AAC	mideye-to-fork	MEF
gram	g	all commonly accepted		mideye-to-tail-fork	METF
hectare	ha	abbreviations	e.g., Mr., Mrs., AM, PM, etc.	standard length	SL
kilogram	kg			total length	TL
kilometer	km	all commonly accepted			
liter	L	professional titles	e.g., Dr., Ph.D., R.N., etc.	Mathematics, statistics	
meter	m			<i>all standard mathematical</i>	
milliliter	mL	at	@	<i>signs, symbols and</i>	
millimeter	mm	compass directions:		<i>abbreviations</i>	
		east	E	alternate hypothesis	H _A
		north	N	base of natural logarithm	<i>e</i>
		south	S	catch per unit effort	CPUE
		west	W	coefficient of variation	CV
		copyright	©	common test statistics	(F, t, χ^2 , etc.)
		corporate suffixes:		confidence interval	CI
		Company	Co.	correlation coefficient	
		Corporation	Corp.	(multiple)	R
		Incorporated	Inc.	correlation coefficient	
		Limited	Ltd.	(simple)	r
		District of Columbia	D.C.	covariance	cov
		et alii (and others)	et al.	degree (angular)	°
		et cetera (and so forth)	etc.	degrees of freedom	df
		exempli gratia		expected value	<i>E</i>
		(for example)	e.g.	greater than	>
		Federal Information		greater than or equal to	≥
		Code	FIC	harvest per unit effort	HPUE
		id est (that is)	i.e.	less than	<
		latitude or longitude	lat. or long.	less than or equal to	≤
		monetary symbols		logarithm (natural)	ln
		(U.S.)	\$, ¢	logarithm (base 10)	log
		months (tables and		logarithm (specify base)	log ₂ , etc.
		figures): first three		minute (angular)	'
		letters	Jan, ..., Dec	not significant	NS
		registered trademark	®	null hypothesis	H ₀
		trademark	™	percent	%
		United States		probability	P
		(adjective)	U.S.	probability of a type I error	
		United States of		(rejection of the null	
		America (noun)	USA	hypothesis when true)	α
		U.S.C.	United States	probability of a type II error	
			Code	(acceptance of the null	
		U.S. state	use two-letter	hypothesis when false)	β
			abbreviations	second (angular)	"
			(e.g., AK, WA)	standard deviation	SD
				standard error	SE
				variance	
				population	Var
				sample	var
Weights and measures (English)					
cubic feet per second	ft ³ /s				
foot	ft				
gallon	gal				
inch	in				
mile	mi				
nautical mile	nmi				
ounce	oz				
pound	lb				
quart	qt				
yard	yd				
Time and temperature					
day	d				
degrees Celsius	°C				
degrees Fahrenheit	°F				
degrees kelvin	K				
hour	h				
minute	min				
second	s				
Physics and chemistry					
all atomic symbols					
alternating current	AC				
ampere	A				
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity	pH				
(negative log of)					
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

SPECIAL PUBLICATION NO. 07-16

**REVIEW OF THE 2007 LOWER COOK INLET AREA COMMERCIAL
SALMON FISHERY, PERSONAL USE COHO SALMON GILLNET
FISHERY, AND SALMON ENHANCEMENT PROGRAMS,
AND AN OVERVIEW OF THE LOWER COOK INLET AREA
HERRING FISHERY/STOCK STATUS**

by

Lee F. Hammarstrom, Ethan G. Ford, and Edward O. Otis
Division of Commercial Fisheries, Homer

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1599

November 2007

The Division of Sport Fish Special Publications series was established in 1991 for the publication of techniques and procedures manuals, informational pamphlets, special subject reports to decision-making bodies, symposia and workshop proceedings, application software documentation, in-house lectures, and other documents that do not fit in another publication series of the Division of Sport Fish. Since 2004, the Division of Commercial Fisheries has also used the same Special Publication series. Special Publications are intended for fishery and other technical professionals. Special Publications are available through the Alaska State Library and on the Internet: <http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm>. This publication has undergone editorial and peer review.

*Lee F. Hammarstrom, Ethan G. Ford, and Edward O. Otis
Alaska Department of Fish and Game, Division of Commercial Fisheries,
3298 Douglas Place, Homer, AK 99603, USA*

This document should be cited as:

Hammarstrom, L. F., E. G. Ford, and E. O. Otis. 2007. Review of the 2007 Lower Cook Inlet area commercial salmon fishery, personal use coho salmon gillnet fishery, and salmon enhancement Programs, and an overview of the Lower Cook Inlet area herring fishery/stock status. Alaska Department of Fish and Game, Special Publication No. 07-16, Anchorage.

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility please write:

ADF&G ADA Coordinator, P.O. Box 115526, Juneau AK 99811-5526

U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, Washington DC 20240

The department's ADA Coordinator can be reached via phone at the following numbers:

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648, (Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

For information on alternative formats and questions on this publication, please contact:

ADF&G, Sport Fish Division, Research and Technical Services, 333 Raspberry Road, Anchorage AK 99518 (907)267-2375.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ii
LIST OF FIGURES.....	iii
ABSTRACT	1
2007 LOWER COOK INLET COMMERCIAL SALMON FISHERY	1
Introduction	1
2007 Lower Cook Inlet Commercial Salmon Season Overview	4
Summary by Species	13
Chinook Salmon	13
Sockeye Salmon.....	15
Coho Salmon	17
Pink Salmon.....	19
Chum Salmon	19
Lower Cook Inlet Commercial Salmon Set Gillnet Fishery	19
2008 Lower Cook Inlet Commercial Salmon Harvest Projections	24
Sockeye Salmon.....	24
Pink Salmon.....	24
Chum Salmon	24
Chinook and Coho Salmon	25
Lower Cook Inlet Salmon Enhancement and Rehabilitation.....	25
Introduction.....	25
Leisure and Hazel Lakes Sockeye Salmon Stocking	26
Bear Lake Sockeye Salmon Enhancement.....	26
Other Sockeye Salmon Lake Stocking.....	30
2007 LOWER COOK INLET PERSONAL USE SALMON GILLNET FISHERY	30
Kachemak Bay Fall Coho Salmon Personal Use Fishery	30
OVERVIEW OF THE LOWER COOK INLET AREA HERRING FISHERY / STOCK STATUS	34
Introduction	34
History and Development of the Sac Roe Fishery	37
Introduction.....	37
Outer/Eastern Districts.....	37
Southern District.....	39
Kamishak Bay District.....	39
2007 Herring Season Overview	41
Assessment Methods.....	41
Kamishak Bay District 2007 Season Summary	45
Southern District 2007 Season Summary	46
Outer/Eastern District 2007 Season Summary.....	46
2008 Herring Season Outlook	47

TABLE OF CONTENTS (Continued)

	Page
Kamishak Bay District.....	47
Other Districts.....	49
Recent and Upcoming Herring Research in Lower Cook Inlet	49
REFERENCES CITED	50

LIST OF TABLES

Table		Page
1.	Commercial, hatchery, and derby salmon catches in numbers of fish by species, district, and gear type, Lower Cook Inlet, 2007.....	4
2.	Commercial salmon catch in numbers of fish by species, Lower Cook Inlet, 1986–2007.....	5
3.	Commercial chum salmon catch in numbers of fish by district, Lower Cook Inlet, 1987–2007.	6
4.	Commercial sockeye salmon catch (including hatchery cost recovery) in numbers of fish by district, Lower Cook Inlet, 1987–2007.....	7
5.	Projected, actual, and average commercial salmon harvests, Lower Cook Inlet, 2007.....	8
6.	Exvessel value of the commercial salmon harvest in thousands of dollars by species, Lower Cook Inlet, 1987–2007.....	9
7.	Exvessel value of the commercial salmon catch in numbers of dollars by species, gear type, and harvest type, Lower Cook Inlet, 2007.	10
8.	Commercial salmon fishing permits issued and fished, by gear type, Lower Cook Inlet, 1987–2007.	11
9.	Commercial pink salmon catch (including hatchery cost recovery) in numbers of fish by district, Lower Cook Inlet, 1987–2007.....	12
10.	Commercial Chinook salmon catch in numbers of fish by district, Lower Cook Inlet, 1987–2007.....	13
11.	Commercial coho salmon catch (including hatchery cost recovery and sales from sport fishing derby) in numbers of fish by district, Lower Cook Inlet, 1987–2007.....	17
12.	Commercial set gillnet catch of salmon in numbers of fish by species in the Southern District, Lower Cook Inlet, 1987–2007.	20
13.	Preliminary 2008 commercial sockeye salmon harvest forecast, Lower Cook Inlet.....	24
14.	Preliminary 2008 commercial salmon harvest forecast by species, Lower Cook Inlet.	25
15.	ADF&G, CIAA, and/or CRRC salmon stocking projects and releases of salmon fry, fingerling, and smolt, in millions of fish, Lower Cook Inlet, 1987–2007.	27
16.	Personal use/subsistence set gillnet salmon catches, in numbers of fish by species, and effort, Southern District, Lower Cook Inlet, 1969–2007.....	32
17.	Historical catch by area in numbers of coho salmon in the Southern District (Kachemak Bay) Personal Use Coho Salmon Gillnet Fishery.....	35
18.	Catch of Pacific herring <i>Clupea pallasii</i> in short tons and effort in number of permits by district in the commercial sac roe seine fishery, Lower Cook Inlet, 1961–2007.....	38
19.	Summary of herring sac roe seine fishery openings and commercial harvests in the Kamishak Bay District of Lower Cook Inlet, 1969–2007.	40
20.	Preseason estimates of biomass and projected commercial sac roe seine harvests, and actual harvests, for Pacific herring <i>Clupea pallasii</i> in short tons, average roe recovery, numbers of permits making landings, and exvessel value in millions of dollars, Kamishak Bay District, Lower Cook Inlet, 1987–2007.....	42
21.	Estimates of Pacific herring <i>Clupea pallasii</i> total biomass in short tons using two different methods, actual commercial sac roe seine harvest in short tons, and percent exploitation, Kamishak Bay District, Lower Cook Inlet, 1981–2007.....	43
22.	Total biomass estimates and commercial catch of Pacific herring <i>Clupea pallasii</i> in short tons by age class, Kamishak Bay District, Lower Cook Inlet, 2007, and 2008 forecast.	47

LIST OF FIGURES

Figure	Page
1. Lower Cook Inlet salmon and herring management area.....	2
2. Commercial set gillnet locations in the Southern District of Lower Cook Inlet.....	3
3. Commercial harvests of Chinook salmon, Lower Cook Inlet, 1987–2007.....	14
4. Commercial harvests of sockeye salmon, Lower Cook Inlet, 1987–2007.	16
5. Commercial harvests of coho salmon, Lower Cook Inlet, 1987–2007.....	18
6. Commercial harvests of pink salmon, Lower Cook Inlet, 1987–2007.	21
7. Commercial harvests of chum salmon, Lower Cook Inlet, 1987–2007.	22
8. Commercial set gillnet harvests of Pacific salmon, Lower Cook Inlet, 1987–2007.....	23
9. Salmon hatcheries and enhancement/rehabilitation sites in Lower Cook Inlet, Alaska.	29
10. Harvests of coho salmon in the Southern District (Kachemak Bay) Coho Salmon Personal Use Gillnet Fishery, Lower Cook Inlet, 1991–2007.....	33
11. Southern, Outer, and Eastern Districts of Lower Cook Inlet.....	36
12. Biomass estimates and commercial harvests (1987–2007) and forecasted return (2008) of Pacific herring in Kamishak Bay, Lower Cook Inlet.	44
13. Pacific herring age composition from samples collected in Kamishak Bay District, Lower Cook Inlet, 2007, and 2008 forecast.....	48

ABSTRACT

The 2007 Lower Cook Inlet commercial salmon fishery was characterized by above average sockeye salmon *Oncorhynchus nerka* harvests and below average Chinook *O. tshawytscha*, coho *O. kisutch*, pink *O. gorbuscha*, and chum *O. keta* salmon harvests. The all-species commercial harvest totaled approximately 662,000 fish, dominated by sockeye salmon at 55%. The commercial fishery exvessel value was approximately \$1.64 million, the fourth lowest over the past decade. Active participation for the only two allowable gear groups, purse seine and set gillnet, finished at record low levels. Although salmon enhancement continued to play a key role in commercial harvests due to 4, or intermittently 5, sockeye salmon lake stocking projects, only one pink salmon hatchery provided supplemental production for the second consecutive season, a decrease from the long-term pattern of two such facilities. The harvest of salmon for cost recovery purposes by hatchery facilities in Lower Cook Inlet, expressed as a proportion of total commercial catches, was estimated at approximately 28% in numbers of fish and 13% in exvessel value for the season, considerably less than the historical average in both categories.

The Southern District Personal Use Coho Salmon Fishery in Kachemak Bay produced an estimated harvest of 1,431 coho salmon, falling near the midpoint of the guideline harvest range of 1,000 to 2,000 coho salmon. Participation in the fishery, at 95 permits actively fished, was an increase over the previous 5 seasons and the highest figure since 2001.

The commercial Pacific herring *Clupea pallasii* fishery in LCI remained closed for the ninth consecutive season due to continuing low abundance levels. Although reasons for the depressed levels remain unclear, a relatively high incidence of the protozoan pathogen *Ichthyophonus* has been detected in herring samples from Kamishak Bay in recent years.

Key words: Lower Cook Inlet, commercial salmon harvest, salmon enhancement, hatchery, cost recovery, personal use fishery, purse seine, set gillnet, escapement, Pacific herring, *Clupea pallasii*, age composition, stock assessment, stock status.

2007 LOWER COOK INLET COMMERCIAL SALMON FISHERY

INTRODUCTION

The Lower Cook Inlet (LCI) management area, comprised of all waters west of the longitude of Cape Fairfield, north of the latitude of Cape Douglas, and south of the latitude of Anchor Point, is divided into 5 commercial salmon fishing districts (Figure 1). The Barren Islands District is the only fishing district where no salmon fishing occurs, with the remaining 4 districts (Southern, Outer, Eastern, and Kamishak Bay) separated into approximately 40 subdistricts and sections to facilitate management of discrete stocks of salmon. Purse seining and set gillnetting are the only allowable gear types in the common property fishery. Approximately 86 seine permits are available for LCI, but the areas where set gillnetting can occur (Figure 2) is extremely limited, and an average of only 22 set gillnet permits have annually participated in that fishery over the past decade.

Pink salmon *Oncorhynchus gorbuscha* have historically provided the bulk of the commercial salmon harvests in LCI, while sockeye salmon *O. nerka* have provided the greatest exvessel value due to a variety of lake stocking enhancement projects throughout the management area. Although enhancement continues to play a significant role in LCI sockeye salmon production, supplemental production of pink salmon decreased considerably with the suspension of activities at Tutka Bay Hatchery in the Southern District at the conclusion of the 2004 season.

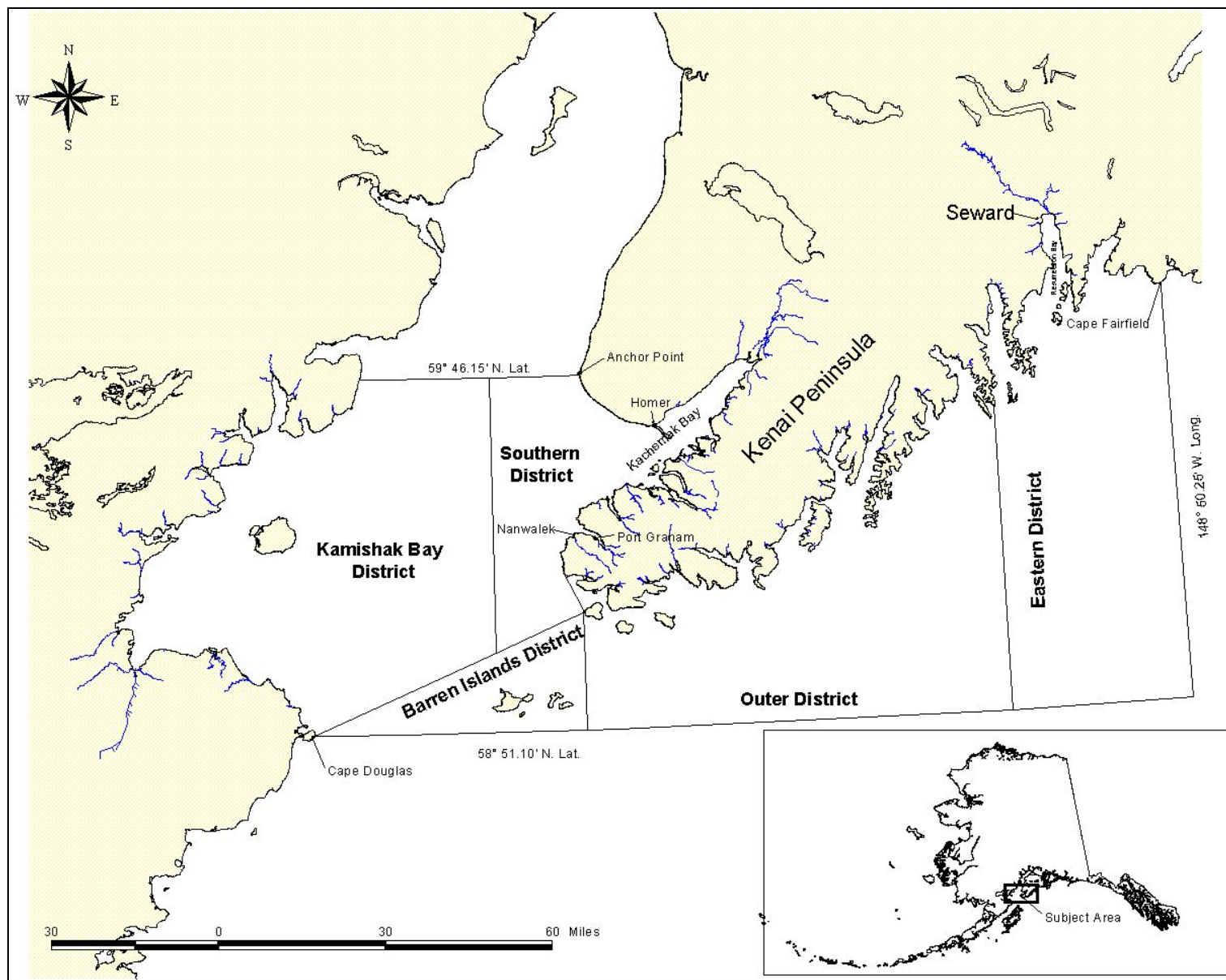


Figure 1.—Lower Cook Inlet salmon and herring management area.

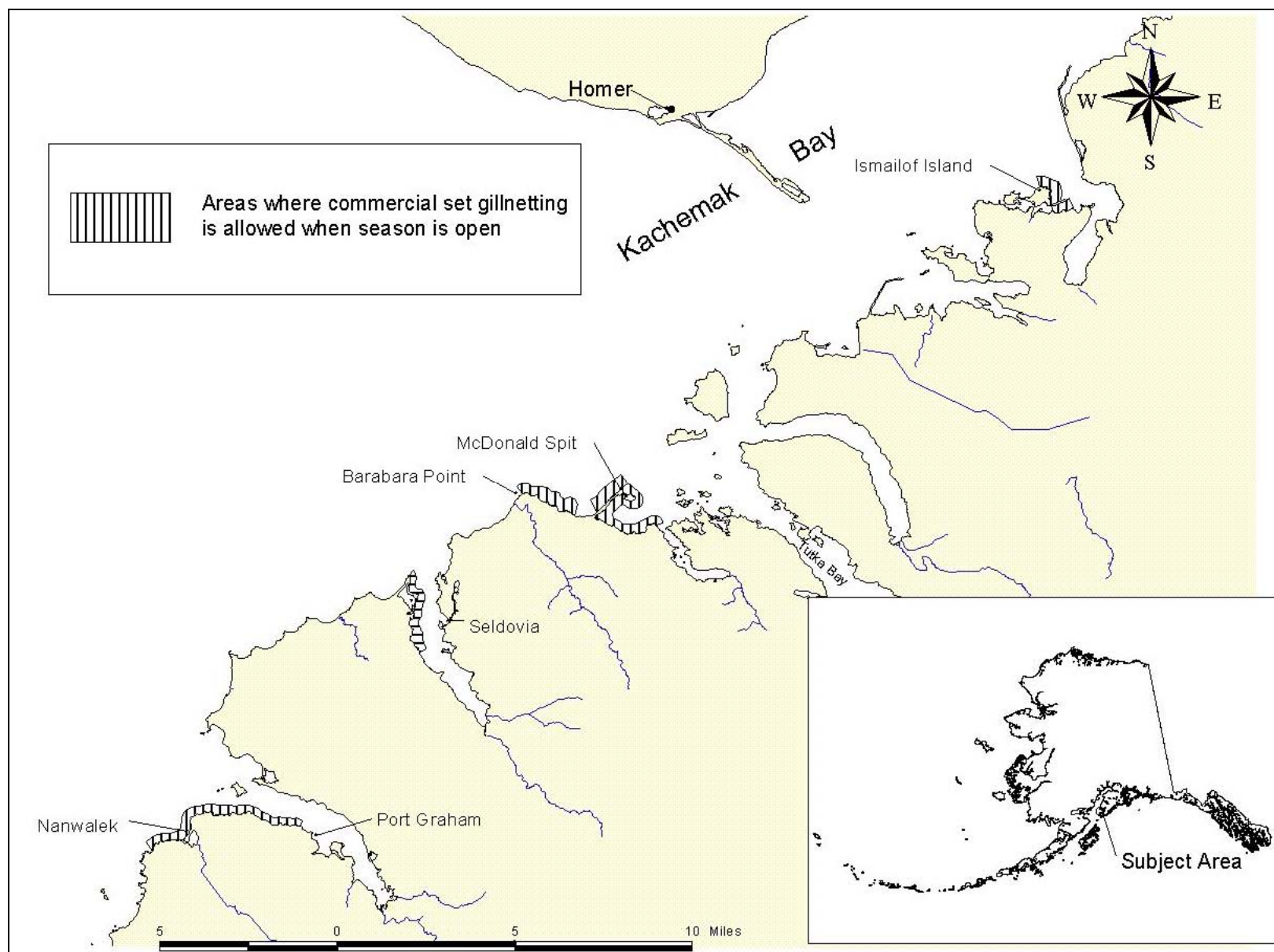


Figure 2.—Commercial set gillnet locations in the Southern District of Lower Cook Inlet.

2007 LOWER COOK INLET COMMERCIAL SALMON SEASON OVERVIEW

The 2007 LCI all-species salmon harvest of 662,199 fish (Tables 1 and 2) was easily the lowest during the past decade, representing only one-third of the recent 10-year average of 2.027 million. The overall harvest failed to achieve the cumulative preseason forecast of 1.45 million fish, in large part due to much smaller than anticipated harvests of natural runs of pink salmon. Additionally, relatively weak returns of chum salmon *O. keta* occurred for the first time in the past 8 years, resulting in a commercial catch of less than 1,800 fish, the lowest since statehood (Table 3). The bright spot in LCI this season was sockeye salmon, with a commercial harvest of just over 366,000 fish, exceeding the recent 10-year average of 298,020 by about 23% (Table 4).

Table 1.—Commercial, hatchery, and derby salmon catches in numbers of fish by species, district, and gear type, Lower Cook Inlet, 2007.

<i>District</i>							
<i>Harvest Type</i>							
	<i>Gear Type</i>	<i>Chinook</i>	<i>Sockeye</i>	<i>Coho</i>	<i>Pink</i>	<i>Chum</i>	<i>Total</i>
<i>Southern</i>							
<i>Commercial</i>							
	Set gillnet	439	28,870	1,616	0	1,437	32,362
	Purse seine	27	61,193	1,710	10,394	127	73,451
<i>Hatchery</i>							
	Purse seine	0	22,609	25	118,157	20	140,811
	<i>Total</i>	<i>466</i>	<i>112,672</i>	<i>3,351</i>	<i>128,551</i>	<i>1,584</i>	<i>246,624</i>
<i>Outer</i>							
<i>Commercial</i>							
	Purse seine / <i>Total</i>	<i>1</i>	<i>32,461</i>	<i>113</i>	<i>147,409</i>	<i>49</i>	<i>180,033</i>
<i>Eastern</i>							
<i>Commercial:</i>							
	Purse seine	0	15,407	0	0	53	15,460
<i>Hatchery:</i>							
	Purse seine	0	1,716	0	0	0	1,716
	Weir	0	6,741	0	0	0	6,741
<i>Derby^a</i>							
	Hook & Line			2,850			2,850
	<i>Total</i>	<i>0</i>	<i>23,864</i>	<i>2,850</i>	<i>0</i>	<i>53</i>	<i>26,767</i>
<i>Kamishak Bay</i>							
<i>Commercial</i>							
	Purse seine	0	169,509	4	4,959	37	174,509
<i>Hatchery</i>							
	Purse seine	0	27,719	1	6,492	54	34,266
	<i>Total</i>	<i>0</i>	<i>197,228</i>	<i>5</i>	<i>11,451</i>	<i>91</i>	<i>208,775</i>
<i>LCI Total</i>		<i>467</i>	<i>366,225</i>	<i>6,319</i>	<i>287,411</i>	<i>1,777</i>	<i>662,199</i>
<i>Percent</i>		<i>0.07%</i>	<i>55.30%</i>	<i>0.95%</i>	<i>43.40%</i>	<i>0.27%</i>	<i>100.00%</i>
<i>1987–2006 Avg.</i>		<i>1,652</i>	<i>273,709</i>	<i>12,602</i>	<i>1,322,110</i>	<i>60,488</i>	<i>1,670,330</i>

Note: Figures for 2007 do not include a very small number of fish caught during commercial fishing periods but not sold (i.e. retained for personal use).

^a Derby catches are fish entered into the Seward Silver Salmon Derby that are subsequently sold to a commercial processor, therefore these catches are considered part of the LCI “commercial harvest.”

Table 2.—Commercial salmon catch in numbers of fish by species, Lower Cook Inlet, 1986–2007.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1987	1,179	248,848	14,354	201,429	157,018	622,828
1988	1,694	319,008	7,946	921,296	321,911	1,571,855
1989	1,893	163,271	12,089	1,296,926	11,305	1,485,484
1990	1,560	203,895	9,297	383,670	6,951	605,373
1991	1,419	317,947	19,047	828,709	24,232	1,191,354
1992	1,891	176,644	5,902	479,768	22,203	686,408
1993	2,168	233,834	13,477	866,774	4,367	1,120,620
1994	1,231	115,418	14,673	1,647,929	5,469	1,784,720
1995	2,303	265,423	17,709	2,848,464	15,636	3,149,535
1996	1,181	449,685	13,572	451,506	3,764	919,708
1997	1,261	240,173	11,004	2,814,431	5,908	3,072,777
1998	1,071	284,029	16,653	1,457,819	4,647	1,764,219
1999	1,764	476,779	8,033	1,140,488	7,941	1,635,005
2000	1,188	240,932	8,203	1,387,307	73,254	1,710,884
2001	988	216,271	6,667	592,931	88,969	905,826
2002	1,553	290,654	8,329	1,970,061	43,259	2,313,856
2003	1,180	644,257	11,302	856,711	35,686	1,549,136
2004 ^a	1,658	130,083	12,426	2,517,555	206,679	2,868,401
2005 ^a	622	232,678	9,126	2,306,842	98,602	2,647,870
2006 ^a	639	224,345	32,230	1,471,578	71,954	1,800,746
2007 ^a	467	366,225	3,351	287,411	1,777	662,199
20-Year Avg.	1,422	273,709	12,602	1,322,110	60,488	1,670,330
1987–1996 Avg.	1,652	249,397	12,807	992,647	57,286	1,313,789
1997–2006 Avg.	1,192	298,020	12,397	1,651,572	63,690	2,026,872
2007 % of Total	0.07%	55.30%	0.95%	43.40%	0.27%	100.00%

Source: ADF&G fish ticket database *Unpublished*.

^a 2004–2007 totals do not include a very small number of fish retained for personal use.

Table 3.—Commercial chum salmon catch in numbers of fish by district, Lower Cook Inlet, 1987–2007.

Year	Southern	Outer	Kamishak	Eastern	Total
1987	5,030	28,663	108,412	14,913	157,018
1988	7,742	71,202	218,299	24,668	321,911
1989	3,141	43	7,809	312	11,305
1990	2,433	614	3,597	307	6,951
1991	1,962	14,337	7,853	80	24,232
1992	1,885	181	20,051	86	22,203
1993	2,788	970	600	9	4,367
1994	2,631	32	14	2,792	5,469
1995	4,530	474	10,302	330	15,636
1996	3,511	3	27	223	3,764
1997	4,260	1,575	7	66	5,908
1998	3,956	611	29	51	4,647
1999	4,624	2,062	23	1,232	7,941
2000	5,340	302	66,072	1,540	73,254
2001	3,789	408	84,766	6	88,969
2002	4,803	3,810	34,641	5	43,259
2003	5,730	137	29,800	19	35,686
2004 ^a	1,372	27,911	177,395	1	206,679
2005 ^a	1,750	12,524	83,943	385	98,602
2006 ^a	2,182	12,883	56,619	270	71,954
2007	1,584	49	91	23	1,777
20-Year Avg.	3,673	8,937	45,513	2,365	60,488
1987–1996 Avg.	3,565	11,652	37,696	4,372	57,286
1997–2006 Avg.	3,781	6,222	53,330	358	63,690
2007 % of Total	89.14%	2.76%	5.12%	2.98%	100.00%

Source: ADF&G fish ticket database *Unpublished*.

^a 2004–2006 totals do not include a very small number of fish retained for personal use.

Table 4.—Commercial sockeye salmon catch (including hatchery cost recovery) in numbers of fish by district, Lower Cook Inlet, 1987–2007.

Year	Southern	Outer	Kamishak	Eastern	Total
1987	89,662	31,845	123,654	3,687	248,848
1988	105,302	9,501	183,952	20,253	319,008
1989	98,052	10,286	46,395	8,538	163,271
1990	82,412	17,404	96,397	7,682	203,895
1991	170,224	6,408	136,612	4,703	317,947
1992	106,793	572	68,847	432	176,644
1993	159,747	4,613	67,650	1,824	233,834
1994	64,531	5,930	35,296	9,661	115,418
1995	164,798	17,642	36,427	46,556	265,423
1996	358,163	14,999	31,604	44,919	449,685
1997	188,402	6,255	11,733	33,783	240,173
1998	196,262	15,991	27,502	44,274	284,029
1999	243,444	51,117	46,913	135,305	476,779
2000	123,574	21,623	31,636	64,099	240,932
2001	155,411	7,339	39,712	13,809	216,271
2002	218,203	21,154	33,921	17,376	290,654
2003	556,037	26,615	51,253	10,352	644,257
2004 ^a	50,699	11,082	51,657	16,645	130,083
2005 ^a	110,739	1	64,987	56,951	232,678
2006 ^a	89,522	3,198	64,577	67,048	224,345
2007 ^a	112,672	32,461	197,228	23,864	366,225
20-Year Avg.	166,599	14,179	62,536	30,395	273,709
1987–1996 Avg.	139,968	11,920	82,683	14,826	249,397
1997–2006 Avg.	193,229	16,438	42,389	45,964	298,020
2007% of Total	30.77%	8.86%	53.85%	6.52%	100.00%

Source: ADF&G fish ticket database *Unpublished*.

^a 2004–2007 totals do not include a very small number of fish retained for personal use.

Table 5 compares the actual catch by species to the preseason forecast and the long-term average. Once again, LCI commercial salmon harvests relied heavily on the success of hatchery and enhanced fish production. Nearly 40% of the LCI sockeye salmon harvest in both numbers of fish and exvessel value was attributed to CIAA lake stocking and fertilization projects at Leisure and Hazel Lakes in the Southern District, Kirschner Lake in the Kamishak Bay District, and Bear Lake in the Eastern District. Pink salmon production from Port Graham Hatchery, operated by Port Graham Hatchery Corporation (PGHC), fell short of expectations, with a harvest of an estimated 118,000 pink salmon. As has been the case since hatchery programs were taken over by private non-profit agencies in LCI, a portion of the salmon harvest was utilized to recoup expenses incurred by the hatchery facilities and the various stocking and enhancement projects throughout the management area. Approximately 28% of the total salmon harvest was taken as cost recovery by CIAA and PGHC (Table 7) to support the sockeye salmon lake stocking programs and Port Graham Hatchery operations, equating to about 13% of the exvessel value of the LCI salmon fishery. Both figures are considered below the historical average for hatchery cost recovery in LCI.

Table 5.—Projected, actual, and average commercial salmon harvests, Lower Cook Inlet, 2007.

SPECIES	2007 PROJECTED HARVEST	2007 ACTUAL HARVEST ^a	1987–2006 AVERAGE
Chinook	1,300 ^b	467	1,422
Sockeye salmon	366,600	366,225	273,709
Coho	14,100 ^b	6,319	12,602
Pink	1,065,300	287,411	1,322,110
Chum	40,600 ^c	1,777	63,690
TOTAL	1,454,900	662,199	1,670,330

^a Preliminary data, which includes common property and hatchery cost recovery harvests and sport derby sales.

^b Commercial harvest forecasts of Chinook and coho salmon represent average harvests since 1980 and are comprised of a combination of naturally-produced fish as well as fish produced from enhancement programs in LCI; no attempt is made to separate the two components.

^c Forecasts for chum salmon are simply average annual commercial harvests since 1989.

Prices paid for salmon this season yielded an estimated LCI exvessel value of approximately \$1.64 million (Tables 6 and 7), making the value of the 2007 harvest approximately 13% less than the recent 10-year average and the fourth lowest during that time period. Seine fishing effort showed a considerable decrease over the previous season, and with only 19 of 86 permit holders making deliveries this season (Table 8), participation fell to a record low level. The number of active set gillnet permits was 16 (Table 8), a significant decrease over the previous season and yet again a record low for that gear group.

Table 6.—Exvessel value of the commercial salmon harvest in thousands of dollars by species, Lower Cook Inlet, 1987–2007.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1987	27	1,951	118	295	598	2,989
1988	32	3,812	127	2,237	2,548	8,756
1989	33	1,213	59	1,660	39	3,004
1990	29	1,287	28	306	31	1,681
1991 ^a	19	1,115	36	275	48	1,493
1992 ^a	30	1,152	19	212	53	1,466
1993 ^a	27	802	41	287	7	1,164
1994 ^a	18	496	93	745	9	1,361
1995 ^a	48	1,381	62	1,245	24	2,760
1996 ^a	26	2,113	42	100	5	2,286
1997 ^a	23	1,066	36	1,286	10	2,421
1998 ^a	20	1,224	37	712	9	2,002
1999 ^a	51	2,459	23	470	20	3,023
2000 ^a	31	1,112	19	431	192	1,786
2001 ^a	24	627	15	277	295	1,238
2002 ^a	24	817	18	441	58	1,359
2003 ^a	15	1,965	18	154	40	2,192
2004 ^a	32	503	40	352	339	1,266
2005 ^a	14	848	27	542	196	1,627
2006 ^a	19	1,018	124	576	185	1,922
2007 ^a	20	1,502	25	89	3	1,639
20 Year Avg.	27	1,348	49	630	235	2,290
1987–1996 Avg.	29	1,532	63	736	336	2,696
1997–2006 Avg.	25	1,163	36	524	134	1,884
2007 % of Total	1.22%	91.64%	1.53%	5.43%	0.18%	100.00%

Source: Values obtained by using the formula: (average price per lb.) x (average weight per fish) x (catch) = exvessel value; average prices are determined only from fish ticket information and may not reflect retroactive or postseason adjustments.

^a Includes hatchery cost recovery.

Table 7.—Exvessel value of the commercial salmon catch in numbers of dollars by species, gear type, and harvest type, Lower Cook Inlet, 2007.

	Chinook	Sockeye	Coho	Pink	Chum	Total
COMMON PROPERTY—PURSE SEINE^a						
No. of Fish	28	278,570	1,827	162,762	266	443,453
Pounds	435	1,228,402	10,224	518,833	1,772	1,759,666
Price/lb.	\$0.70	\$0.88	\$0.50	\$0.11	\$0.25	
Value	\$305	\$1,068,136	\$5,114	\$56,274	\$444	\$1,130,273
COMMON PROPERTY—SET GILLNET^a						
No. of Fish	439	28,870	1,616		1,437	32,362
Pounds	7,323	173,589	10,270		10,032	201,214
Price/lb.	\$2.73	\$1.44	\$0.46		\$0.25	
Value	\$20,016	\$249,541	\$4,713	0	\$2,509	\$276,779
HATCHERY—PURSE SEINE & WEIR						
No. of Fish		58,785	26	124,649	74	183,534
Pounds		253,803	192	405,271	568	659,834
Price/lb.		\$0.73 ^b	\$0.18 ^b	\$0.08	\$0.21	
Value		\$184,305	\$35	\$32,422	\$119	\$216,881
SPORT FISHING DERBY^c—HOOK & LINE						
No. of Fish			2,850			2,850
Pounds			21,375			21,375
Price/lb.			\$0.72			
Value			\$15,390			\$15,390
TOTAL ALL GEARS						
No. of Fish	467	366,225	6,319	287,411	1,777	662,199
Pounds	7,758	1,655,794	42,061	924,104	12,372	2,642,089
Price/lb.	\$2.62	\$0.91 ^b	\$0.60 ^b	\$0.10	\$0.25	
Value	\$20,321	\$1,501,982	\$25,252	\$88,696	\$3,072	\$1,639,323

Note: Exvessel value is calculated from average prices, which are determined only by fish ticket information and may not reflect retroactive or postseason adjustments.

^a 2007 seine and set gillnet totals do not include a very small number of fish not sold but retained for personal use.

^b Average price per pound for hatchery cost recovery sockeye salmon and coho salmon, and average price for the all gears' total, reflect only those fish actually sold and do not include hatchery fish that were donated.

^c Fish entered into the Seward Silver Salmon Derby are subsequently sold to a commercial processor and are therefore considered "commercial harvest."

Table 8.—Commercial salmon fishing permits issued and fished, by gear type, Lower Cook Inlet, 1987-2007.

Year	Purse Seine				Set Net Permits
	Permanent	Interim	Total	Actively	Fished
1987	79	0	79	66	29
1988	79	0	79	71	27
1989	83	0	83	64	23
1990	82	1	83	71	20
1991	82	1	83	68	20
1992	82	1	83	63	21
1993	82	1	83	51	17
1994	82	1	83	32	16
1995	83	1	84	49	23
1996	84	1	85	34	24
1997	84	1	85	23	25
1998	84	2	85	41	24
1999	84	2	86	45	20
2000	84	2	86	36	24
2001	84	2	86	25	18
2002	84	2	86	25	24
2003	84	2	86	27	24
2004	84	2	86	24	19
2005	84	2	86	29	17
2006	84	2	86	24	22
2007	84	2	86	19	16
1987–2006 Avg.	83	1	84	43	22
1997–2006 Avg.	84	2	86	30	22

Source: Commercial Fisheries Entry Commission *Unpublished*; ADF&G fish ticket database *Unpublished*.

The absence of regular tender service in remote districts, a notable factor that has affected the amount and distribution of seine effort, and ensuing harvest of salmon, in LCI over the past 13 years, once again influenced overall harvests during 2007. Historically, processors routinely stationed a tender (or tenders) in remote districts in anticipation of salmon harvests, even when run strengths and catches were marginal. Since 1994 however, processors have reduced or eliminated tender service to remote areas to reduce costs. Fishermen are now forced to devise their own means to transport fish from these remote areas for processing. Due to equipment limitations and the high cost of contracting out for tendering services, significant numbers of fishermen were often unable to fish in remote areas, while a few retained the flexibility to fish these traditional areas because of onboard chilling equipment or personally-owned tenders. Despite considerable opportunity to harvest reasonably strong natural pink salmon returns in 2007, the harvest of that species was less than one-fifth of the recent 10-year average (Table 9), primarily due to the lack of consistent tender service in remote districts. Prices for salmon in LCI were variable, with that for Chinook *O. tshawytscha* and coho salmon *O. kisutch* increasing over the previous season, while prices for the remaining 3 species dropped.

Table 9.—Commercial pink salmon catch (including hatchery cost recovery) in numbers of fish by district, Lower Cook Inlet, 1987–2007.

Year	Southern	Outer	Kamishak	Eastern	Total
1987	90,522	23,890	72,684	14,333	201,429
1988	852,382	6,094	61,080	1,740	921,296
1989	987,488	52,677	256,669	92	1,296,926
1990	178,087	191,320	2,448	11,815	383,670
1991	253,962	359,664	47,833	167,250	828,709
1992	417,021	146	2,594	60,007	479,768
1993	692,794	159,159	4,205	10,616	866,774
1994	1,589,709	13,200	33	44,987	1,647,929
1995	2,475,312	192,098	169,054	12,000	2,848,464
1996	444,236	7,199	36	35	451,506
1997	2,685,764	128,373	293	1	2,814,431
1998	1,315,042	102,172	1,776	38,829	1,457,819
1999	1,105,267	32,484	807	1,930	1,140,488
2000	1,070,065	306,555	6,214	4,473	1,387,307
2001	542,975	48,559	1,397	0	592,931
2002	953,960	569,955	446,146	0	1,970,061
2003	563,043	281,663	12,005	0	856,711
2004 ^a	2,461,950	42,636	12,969	0	2,517,555
2005 ^a	2,175,386	110,195	7,761	13,500	2,306,842
2006 ^a	263,749	1,121,892	82,477	3,460	1,471,578
2007 ^a	128,551	147,409	11,451	0	287,411
20-Year Avg.	1,055,936	187,497	59,424	19,253	1,322,110
1987–1996 Avg.	798,151	100,545	61,664	32,288	992,647
1997–2006 Avg.	1,313,720	274,448	57,185	6,219	1,651,572
2007 % of Total	44.73%	51.29%	3.98%	0.00%	100.00%

Source: ADF&G fish ticket database *Unpublished*.

^a 2004–2007 totals do not include a very small number of fish retained for personal use.

SUMMARY BY SPECIES

Chinook Salmon

The 2007 harvest of Chinook salmon, not normally a commercially important species in LCI, totaled 467 fish, less than 40% of the average during the last decade and only one-third of the long-term average of just over 1,400 fish (Table 10; Figure 3). Virtually all of the catch came from the Southern District (Tables 1 and 10), with the majority taken in Halibut Cove Subdistrict. Set gillnetters accounted for 94% of the Southern District Chinook catch (Table 1), with purse seiners taking the remaining 6%.

Table 10.—Commercial Chinook salmon catch in numbers of fish by district, Lower Cook Inlet, 1987–2007.

Year	Southern	Outer	Kamishak	Eastern	Total
1987	1,158	14	7	0	1,179
1988	1,655	5	33	1	1,694
1989	1,889	1	3	0	1,893
1990	1,546	2	12	0	1,560
1991	1,399	2	17	1	1,419
1992	1,852	0	39	0	1,891
1993	2,162	2	4	0	2,168
1994	1,230	0	0	1	1,231
1995	2,289	12	2	0	2,303
1996	1,180	0	1	0	1,181
1997	1,261	0	0	0	1,261
1998	1,070	0	0	1	1,071
1999	1,760	3	0	1	1,764
2000	1,184	2	1	1	1,188
2001	986	0	2	0	988
2002	1,553	0	0	0	1,553
2003	1,179	1	0	0	1,180
2004 ^a	1,656	2	0	0	1,658
2005 ^a	621	0	1	0	622
2006 ^a	636	3	0	0	639
2007 ^a	466	1	0	0	467
20-Year Avg.	1,413	2	6	0	1,422
1987–1996 Avg.	1,636	4	12	0	1,652
1997–2006 Avg.	1,191	1	0	0	1,192
2007 % of Total	99.79%	0.21%	0.00%	0.00%	100.00%

Source: ADF&G fish ticket database *Unpublished*.

^a 2004–2007 totals do not include a very small number of fish retained for personal use.

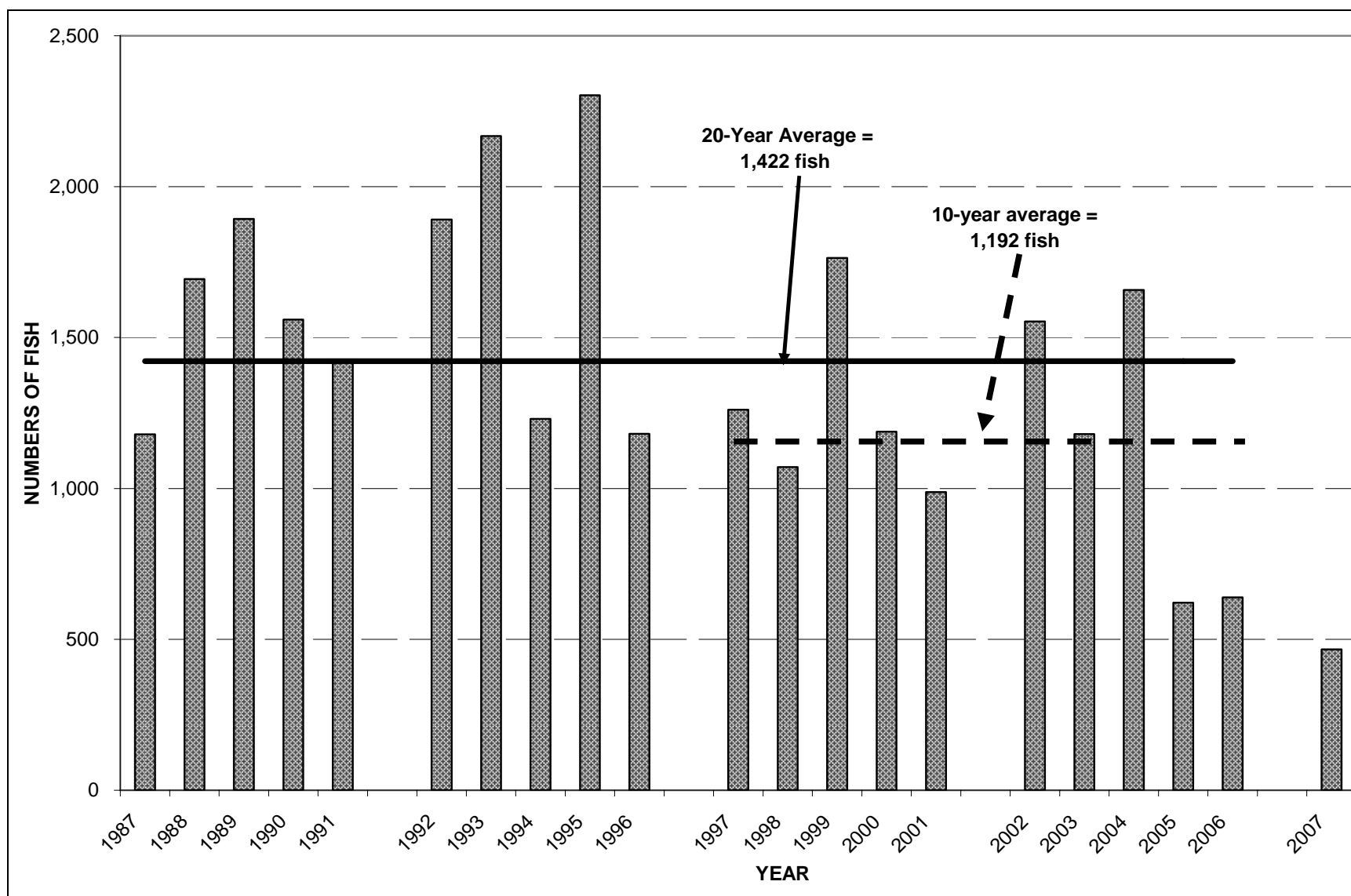


Figure 3.—Commercial harvests of Chinook salmon, Lower Cook Inlet, 1987–2007.

Sockeye Salmon

The 2007 LCI sockeye salmon harvest of 366,225 fish (Table 4; Figure 4) was the highest since 2003 and the third highest in the last decade. Despite accounting for 55% of the LCI salmon harvest in numbers of fish, sockeye salmon provided over 90% of the exvessel value of the entire salmon fishery during 2007 (Tables 6 and 7). Unfortunately, returns of hatchery-produced sockeye salmon, frequently the mainstay of the LCI fishery, were disappointing in 2007. Harvests of enhanced runs of sockeye salmon returning to Leisure and Hazel Lakes in the Southern District, at a combined total of an estimated 83,800 fish, failed to achieve preseason predictions and were far below the traditional average provided by these two projects. In the Kamishak Bay District, the enhanced return to Kirschner Lake produced a harvest of 35,400 sockeye salmon, but the majority were utilized for hatchery cost recovery. At Bear Lake in Resurrection Bay of the Eastern District, with a preseason forecast calling for a harvest approaching 100,000 fish, the enhanced sockeye salmon return was much weaker than predicted, with commercial seiners landing just over 15,000 fish, while CIAA harvested an additional 8,500 sockeye salmon for cost recovery.

In contrast, natural returns of sockeye salmon to LCI systems ranged from good to outstanding in 2007, with all 5 systems achieving their established escapement goals. Escapement at Delight Lake in East Nuka Bay of the Outer District, enumerated via a picket weir in conjunction with aerial surveys, set a record with 44,000 sockeye salmon documented into the lake. The peak daily aerial survey escapement estimate at nearby Desire Lake, with a sustainable escapement goal (SEG) range of 8,800–15,200, totaled 10,000 sockeye salmon. Additionally, over 32,000 sockeye salmon were harvested by the seine fleet in East Nuka Bay Subdistrict. At Chenik Lake in the Kamishak Bay District, the sockeye salmon return was one of the best on record, with a harvest of over 160,000 fish and an escapement approximately doubling the upper bound of the SEG range of 1,900–9,300 sockeye salmon. No directed fishing effort or harvest occurred at Mikfik Lake, also in the Kamishak Bay District, thus the entire run entered the system as escapement and fell near the upper end of the established SEG range of 6,300–12,150 fish. Escapement of sockeye salmon at small Aialik Lake in the Eastern District was estimated to fall near the midpoint of the SEG range of 3,700–8,000 fish but no fishing was allowed to target this stock. At English Bay Lakes in the Southern District, which has been enhanced during some seasons over the past two decades, the return of sockeye salmon was better than expected, producing an escapement of nearly 17,000 fish, slightly exceeding the SEG range of 6,000–13,500. Additionally, almost 4,300 sockeye salmon were harvested in the nearby commercial set gillnet fishery of Port Graham Subdistrict, while residents of Port Graham and Nanwalek also harvested fish destined for English Bay Lakes for subsistence purposes.

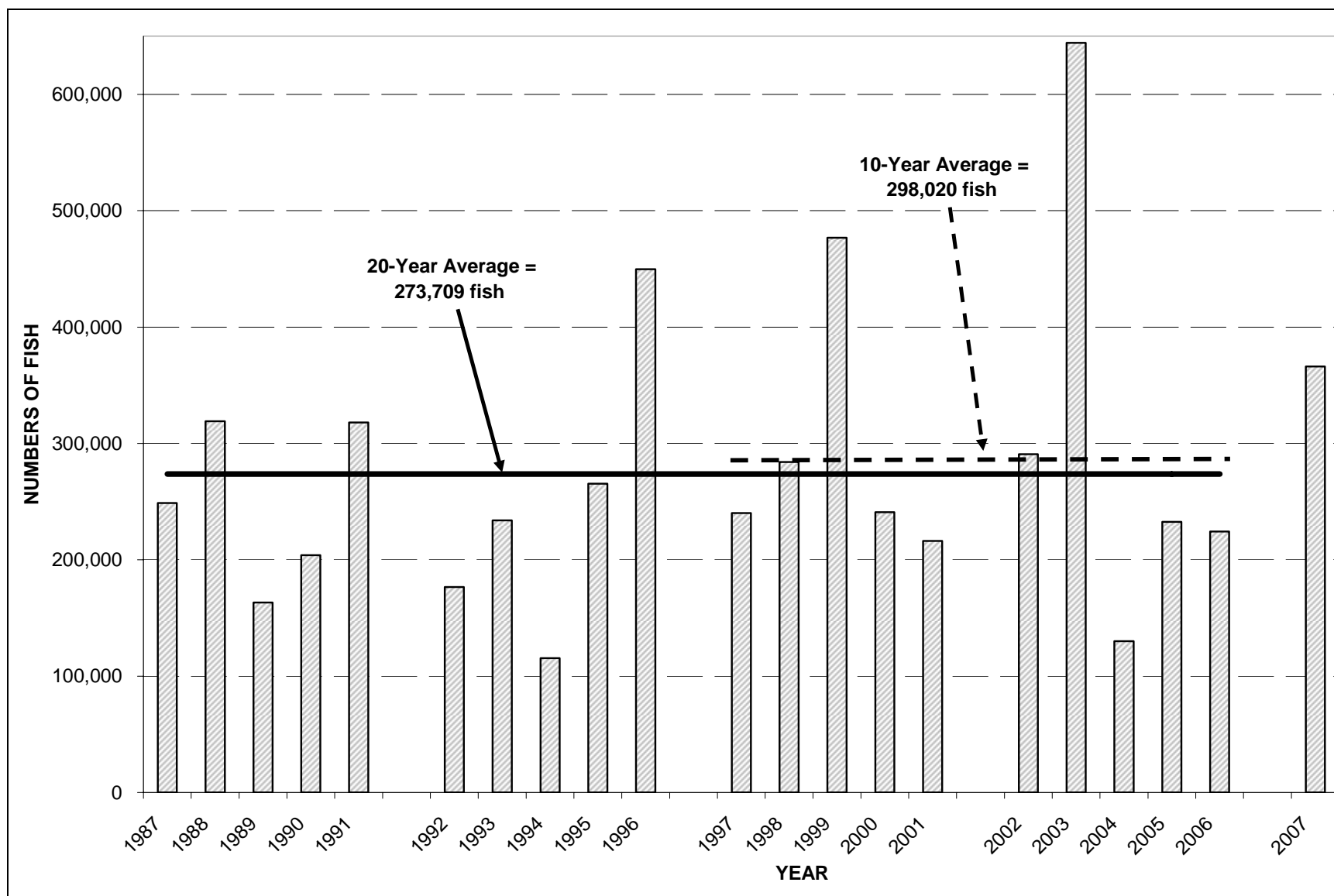


Figure 4.—Commercial harvests of sockeye salmon, Lower Cook Inlet, 1987–2007.

COHO SALMON

The coho salmon resource is not extensive in the LCI management area, and as a result this species rarely attains commercial prominence. The commercial harvest of 6,319 coho salmon to date in 2007 was only about half of the recent 10-year average for this species (Table 11; Figure 5), although this figure is expected to increase marginally due to hatchery harvest. The Eastern District, which frequently dominates coho catches because of the Seward Silver Salmon Derby and CIAA hatchery cost recovery at Bear Lake, accounted for around 45% of the area-wide coho harvest, with the remainder about equally split between seiners and set gillnetters in the Southern District. Regarding sport derby catches, it should be noted that all coho salmon entered into the Seward Silver Salmon Derby are subsequently sold by the city of Seward, the organizer of this sport fishing derby, to a commercial processor. As a result, these catches are considered “commercial harvests” and are listed in the commercial catch tables to document this fact. In 2007, a total of 2,850 coho salmon were entered into the Seward Silver Salmon Derby (Tables 1 and 7).

Coho salmon run assessment in LCI is limited, with commercial, sport, and personal use harvests providing the best indicators of run strength, and overall the returns during 2007 were considered good. Two aerial surveys were flown specifically for coho salmon this season, indicating excellent escapement into Clearwater Slough, the major index stream at the head of Kachemak Bay.

Table 11.—Commercial coho salmon catch (including hatchery cost recovery and sales from sport fishing derby) in numbers of fish by district, Lower Cook Inlet, 1987–2007.

Year	Southern	Outer	Kamishak	Eastern	Total
1987	2,163	2,481	8,079	1,631	14,354
1988	2,987	2	4,471	486	7,946
1989	6,667	72	4	5,346	12,089
1990	1,552	74	26	7,645	9,297
1991	9,415	12	2,337	7,283	19,047
1992	1,277	1	1,488	3,136	5,902
1993	4,431	119	3	8,924	13,477
1994	1,373	993	1,897	10,410	14,673
1995	5,161	1,272	6,084	5,192	17,709
1996	9,543	96	1	3,932	13,572
1997	5,597	63	0	5,344	11,004
1998	2,243	45	0	14,365	16,653
1999	2,757	1,482	0	3,794	8,033
2000	768	20	7	7,408	8,203
2001	2,706	5	9	3,947	6,667
2002	3,769	74	54	4,432	8,329
2003	5,408	4	4	5,886	11,302
2004 ^a	1,441	13	5,367	5,615	12,436
2005 ^a	2,722	3	92	6,309	9,126
2006 ^a	3,036	1,139	24,269	3,786	32,230
2007 ^a	3,351	113	5	2,850	6,319
20-Year Avg.	3,750	399	2,710	5,744	12,602
1987–1996 Avg.	4,457	512	2,439	5,399	12,807
1997–2006 Avg.	3,044	285	2,980	6,089	12,397
2007 % of Total	53.03%	1.79%	0.08%	45.10%	100.00%

Source: ADF&G fish ticket database *Unpublished*.

^a 2004–2007 totals do not include a very small number of fish retained for personal use.

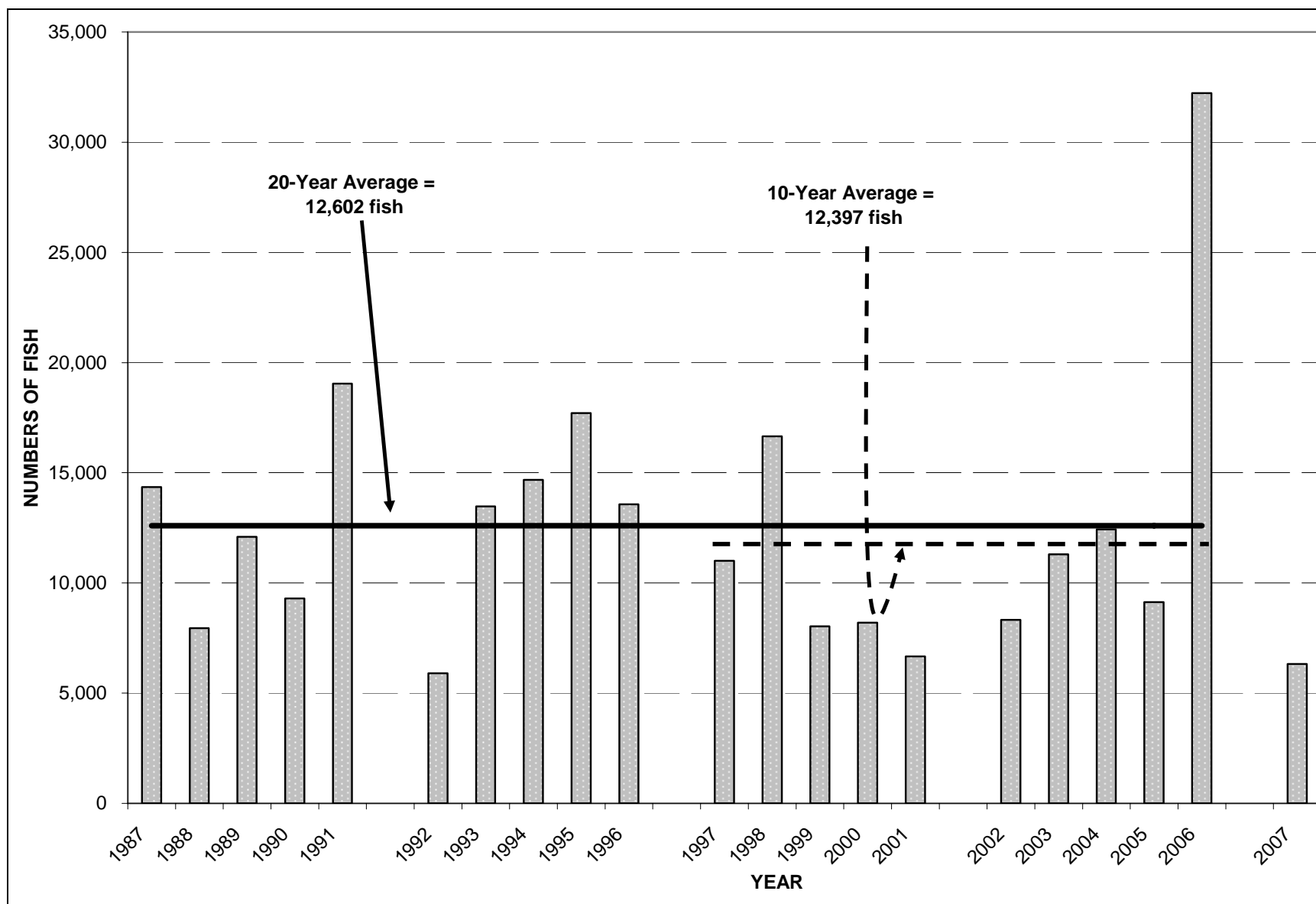


Figure 5.—Commercial harvests of coho salmon, Lower Cook Inlet, 1987–2007.

Pink Salmon

Harvests of pink salmon, normally the dominant species in numbers of commercially harvested fish in LCI, fell far short of preseason expectations in 2007, with an overall catch of 287,411 fish (Table 9; Figure 6). This figure is less than one-fifth of the most recent 10-year average and represents the lowest catch of this species since 1987, the last year that pink salmon were not the most numerous salmon species in the LCI commercial harvest. About 45% (128,551 pink salmon) of the total was taken in the Southern District (Tables 1 and 9), the majority of which was a direct result of Port Graham Hatchery production. However, approximately 92% of the Southern District total was utilized for hatchery cost recovery at that facility. The Outer District produced the greatest contribution of pink salmon to LCI harvests, with a total catch of over 147,000 naturally produced fish (Table 9), or slightly more than half of the LCI total. The majority of this catch came from directed efforts in Port Dick Subdistrict, where catches would have undoubtedly been higher had markets been stronger. For the most part, pink salmon systems along the outer Gulf of Alaska coast experienced reasonably good returns. In the Kamishak Bay District, overall returns of pink salmon were very strong, but despite numerous and liberal commercial openings, no targeted harvest occurred given the low prices and lack of tender service. As expected under these circumstances, pink salmon escapements were achieved or exceeded at virtually all systems within the management area.

Chum Salmon

After a 7-year string of relatively strong returns, chum salmon were a disappointment in the 2007 LCI commercial salmon season. The chum salmon harvest of less than 1,800 fish was the lowest catch on record for the species in LCI (Table 3; Figure 7). For the first time in many seasons, several areas of Kamishak Bay District on the west side of LCI were closed to commercial fishing in order to protect chum salmon for escapement purposes. Escapements into most Kamishak Bay chum systems were sufficient to achieve goals, with the exception of McNeil River, where the escapement fell short of its established goal range for the thirteenth time in the last 18 years (but only by 200 fish). Elsewhere in the management area, Outer District chum returns were considered weak, and no directed openings were allowed.

LOWER COOK INLET COMMERCIAL SALMON SET GILLNET FISHERY

An Area H set gillnet permit allows fishing in any part of Cook Inlet (both Upper and Lower). However, there are only 5 beach areas in LCI, all located along the south shore of Kachemak Bay in the Southern District (Figure 2), where commercial set gillnets may be used. The limited area provides only enough productive fishing sites to accommodate up to 25 set gillnet permits.

The 2007 LCI all-species set gillnet harvest totaled 32,362 fish (Table 12; Figure 8), representing less than 5% of the cumulative LCI harvest and falling far short of both the recent 10- and 20-year averages for this gear type. Set gillnet effort this season totaled only 16 permits, the fewest since implementation of the limited entry permit program and less than the average of 22 permits fished over the past decade. Catches were dominated by sockeye salmon at 89% (28,870 fish) followed by coho salmon at 5% and chum salmon at 4%. For comparison, typical species composition in the commercial set gillnet fishery during the past decade has been 61% sockeye salmon, 28% pink, 6% chum, 3% coho, and 2% Chinook salmon. The sockeye salmon total for 2007 was about 84% of the recent 10-year average of approximately 34,000 fish for this species (Table 12). Catches of Chinook salmon, at 439 fish, were the lowest since 1981 and less than half of the most recent 10- and 20-year averages for the species.

Table 12.—Commercial set gillnet catch of salmon in numbers of fish by species in the Southern District, Lower Cook Inlet, 1987–2007.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1987	653	28,209	2,025	9,224	2,419	42,530
1988	1,145	14,758	2,819	29,268	4,423	52,413
1989	1,281	13,970	4,792	16,210	1,877	38,130
1990	1,361	15,863	1,046	12,646	1,938	32,854
1991	842	20,525	5,011	3,954	1,577	31,909
1992	1,288	17,002	848	15,958	1,687	36,783
1993	1,089	14,791	3,088	12,008	2,591	33,567
1994	1,103	14,004	1,073	23,621	2,419	42,220
1995	2,078	19,406	3,564	41,654	3,958	70,660
1996	1,054	69,338	5,779	14,813	2,792	93,776
1997	1,135	59,401	4,475	64,162	4,166	133,339
1998	952	26,131	1,057	24,403	3,754	56,297
1999	1,491	27,646	1,374	5,348	4,313	40,194
2000	1,019	26,503	621	21,845	5,214	55,202
2001	865	28,503	1,811	13,393	3,487	48,059
2002	1,513	46,812	2,393	6,741	4,681	62,140
2003	878	81,722	2,291	7,325	4,998	97,214
2004 ^a	1,400	16,087	1,164	834	1,234	20,719
2005 ^a	525	15,669	1,905	341	1,326	19,766
2006 ^a	580	14,219	2,426	12,289	2,019	31,533
2007 ^a	439	28,870	1,616	0	1,437	32,362
20-Year Avg.	1,113	28,528	2,478	16,802	3,045	51,965
1987–1996 Avg.	1,189	22,787	3,005	17,936	2,568	47,484
1997–2006 Avg.	1,036	34,269	1,952	15,668	3,521	56,446
2007 % of Total	1.36%	89.21%	4.99%	0.00%	4.44%	100.00%

Source: ADF&G fish ticket database *Unpublished*.

^a 2004–2007 totals do not include a very small number of fish retained for personal use.

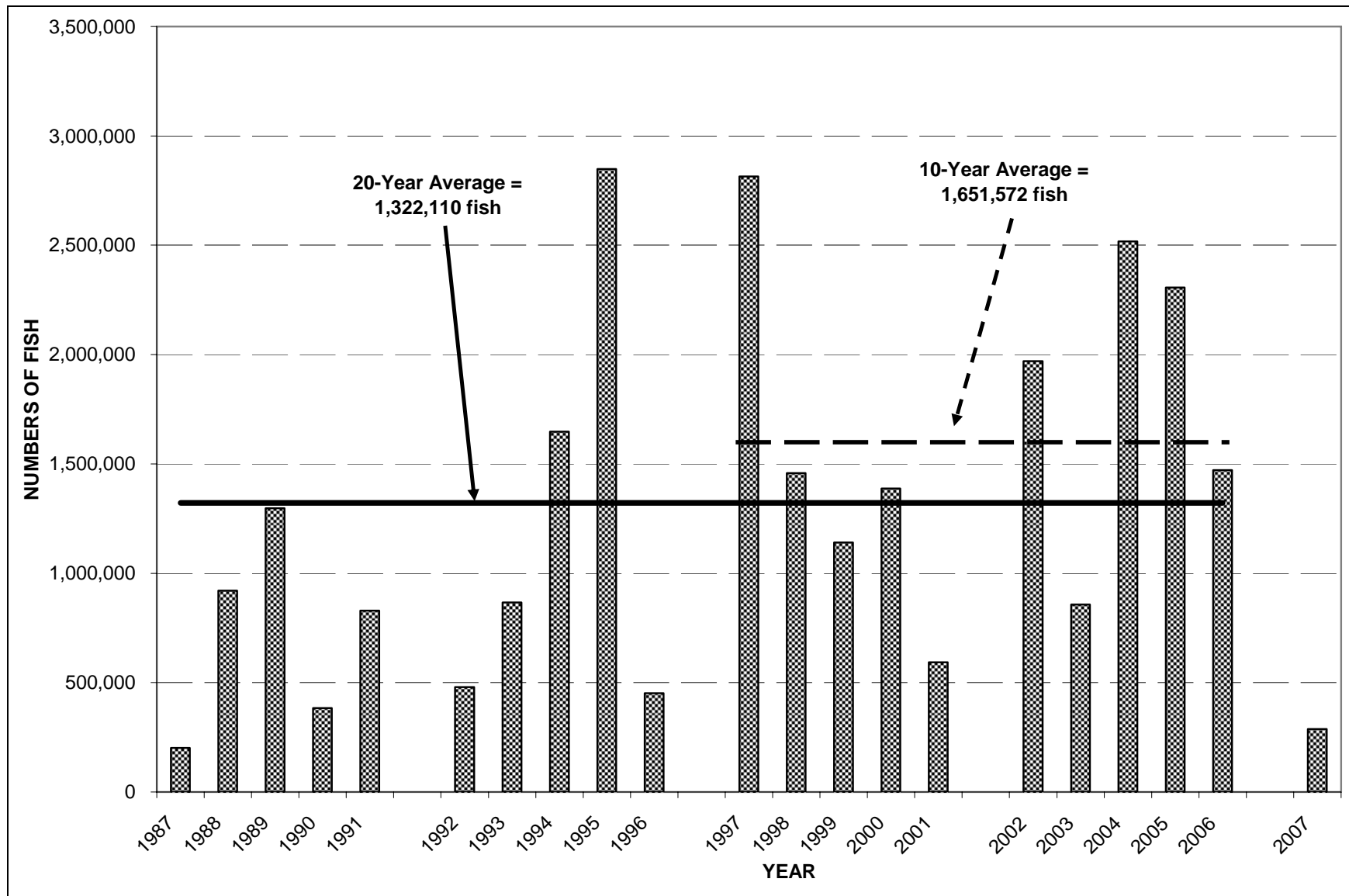


Figure 6.—Commercial harvests of pink salmon, Lower Cook Inlet, 1987–2007.

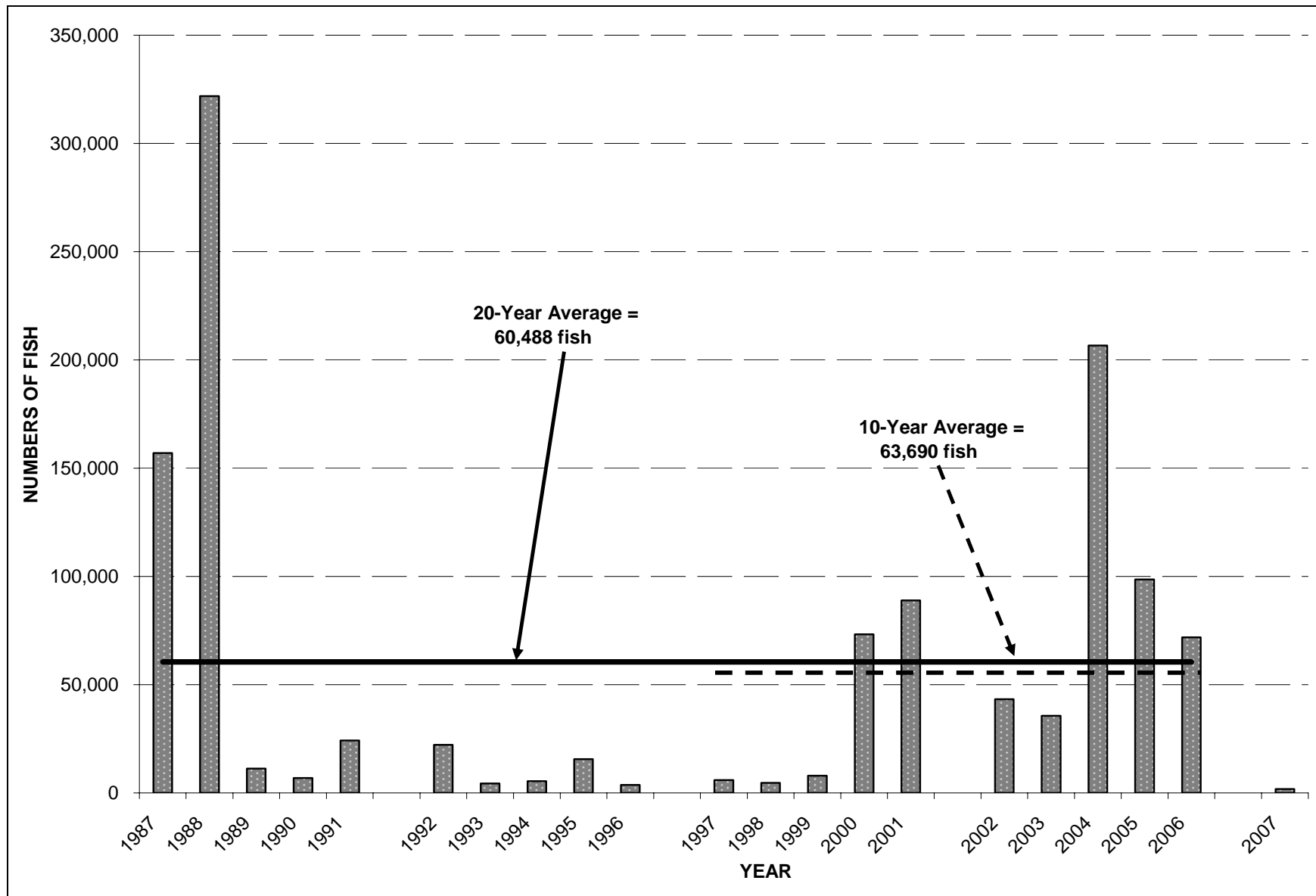


Figure 7.—Commercial harvests of chum salmon, Lower Cook Inlet, 1987–2007.

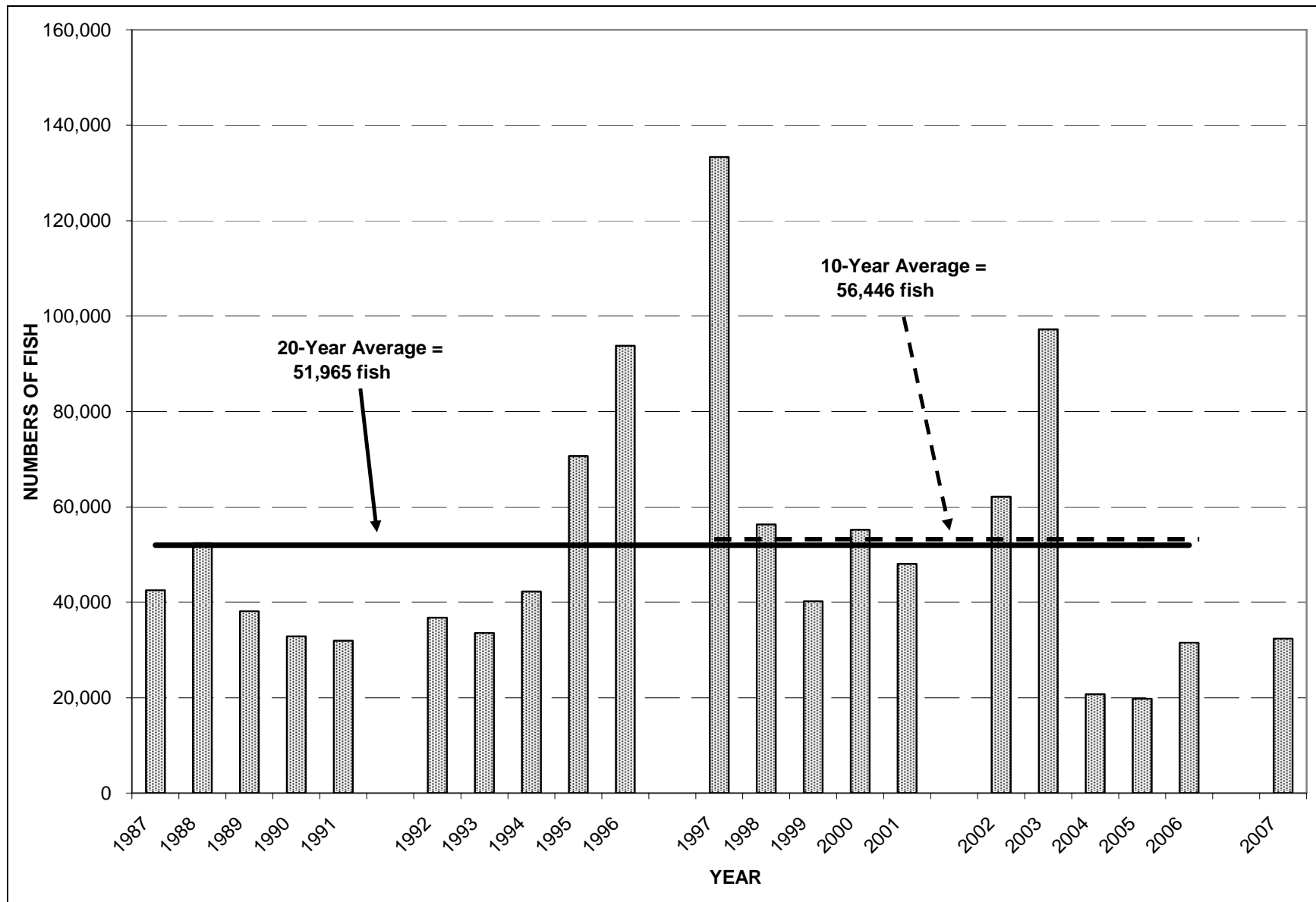


Figure 8.—Commercial set gillnet harvests of Pacific salmon, Lower Cook Inlet, 1987–2007.

2008 LOWER COOK INLET COMMERCIAL SALMON HARVEST PROJECTIONS

Sockeye Salmon

Sockeye salmon harvest projections in Lower Cook Inlet are based on both forecasts of fish returning to enhancement sites and average historical harvests of natural runs. The preliminary 2008 forecasted harvest of sockeye salmon is about 361,000 fish, slightly less than the 366,000 fish landed in 2007 but about 21% greater than the average annual catch of 298,000 sockeye salmon during the last decade. If realized, this harvest would represent the fourth highest for sockeye salmon in LCI over the past 10 years. Projected sockeye salmon harvests are represented in Table 13.

Table 13.—Preliminary 2008 commercial sockeye salmon harvest forecast, Lower Cook Inlet.

<i>PRELIMINARY LCI SOCKEYE SALMON HARVEST FORECAST</i>			
ENHANCED		NATURAL	
Kirschner Lake	26,900	Southern District	41,500
Leisure Lake	76,500	Outer District	21,200
Hazel Lake	53,000	Eastern District	6,700
Tutka Lagoon	21,700	Kamishak Bay District	18,600
Bear Lake	94,600		
English Bay Lakes	0		
TOTAL	272,700	TOTAL	88,000

Pink Salmon

Pink salmon returns in LCI cyclically interchange between odd- and even-year dominance approximately every 5 to 10 years, with the present trend biased towards the latter. The 2008 LCI pink salmon harvest is projected to approach 826,000 fish, which would make it the fourth lowest catch in the past decade (*Otis In prep b*). Due to a turnover in personnel at Port Graham Hatchery in the Southern District, no formal pink salmon forecast was prepared for that facility in 2008. However, because juvenile pink salmon were released as unfed fry from that location in the spring of 2007, survival is expected to be relatively low and returning adults are not anticipated to contribute significantly to commercial harvests. As a result, commercial catches of pink salmon in LCI during 2008 are expected to be comprised entirely of natural production. As has been the case in recent years, market conditions and tender availability in remote districts will play a larger role in commercial pink salmon harvests than the magnitude of the returns themselves.

Chum Salmon

Based solely on the average annual catch since 1989, chum salmon harvests in LCI during 2008 are forecasted to total approximately 39,000 fish. However, after 7 consecutive seasons of good to excellent returns, the 2007 LCI chum returns were relatively weak, and commercial catches were the lowest on record. Given this information, next season's harvest forecast remains questionable. Because the price paid and market demand for this species will likely affect the actual harvests, the chum forecast should be interpreted with caution.

Chinook and Coho Salmon

No formal harvest forecast is prepared for Chinook or coho salmon in LCI. However, average annual harvests since 1980 suggest that about 1,250 Chinook and 13,850 coho salmon can be expected to contribute to LCI commercial harvests in 2008.

Table 14 summarizes the preliminary projected harvest figures by species in the Lower Cook Inlet management area during 2008:

Table 14.—Preliminary 2008 commercial salmon harvest forecast by species, Lower Cook Inlet.

	Natural	Enhanced	Total
CHINOOK	^a	^a	1,250 ^a
SOCKEYE SALMON	88,000 ^b	272,700 ^c	360,700
COHO	^a	^a	13,850 ^a
PINK	825,800	0 ^c	825,800
CHUM	38,600 ^b	0	38,600
Total	952,400	272,700	1,240,200

^a Commercial harvest forecasts of Chinook and coho salmon represent average harvests since 1980 and are comprised of a combination of naturally-produced fish as well as fish produced from enhancement programs in LCI; no attempt is made to separate the two components.

^b Forecasts for naturally-produced sockeye salmon and chum salmon are simply average annual commercial harvests since 1980 and 1989 (respectively).

^c Includes common property plus cost recovery harvests.

LOWER COOK INLET SALMON ENHANCEMENT AND REHABILITATION

Introduction

Fisheries enhancement has played an important role in LCI salmon production for approximately 30 years. Natural adult salmon returns to the LCI area continue to demonstrate wide fluctuations, often the result of environmental impacts such as flooding or ice scouring on spawning grounds. Since their inception in the mid-1970's, enhancement and rehabilitation projects have made significant contributions to commercial, sport, personal use, and subsistence fishing harvests. These contributions have historically ranged from 24% to 90% of the entire LCI commercial salmon harvest and are expected to remain relatively high in future years.

Projects initiated by ADF&G and presently being undertaken by CIAA and/or PGHC provided an estimated 39% (261,000 salmon) of the total 2007 LCI commercial harvest of 662,200 fish. The Leisure/Hazel, Kirschner, and Bear Lakes sockeye salmon enhancement projects produced about 39% (143,100 fish) of the total LCI sockeye salmon harvest of 366,200 fish in 2007. Port Graham Hatchery production accounted for about 41% (118,000 fish) of the 2007 LCI commercial pink salmon harvest of 287,400 fish.

Using average fish weights and average prices per pound in LCI, the estimated contribution of salmon produced by CIAA and PGHC was 37% (\$0.61 million) of the \$1.64 million total value of the 2007 LCI commercial salmon harvest. About 13% (\$0.22 million) of the total exvessel value of the fishery was utilized for hatchery cost recovery purposes (Table 7). A brief description of the more notable enhancement projects specifically affecting the commercial fishery in LCI follows.

Leisure and Hazel Lakes Sockeye Salmon Stocking

Leisure Lake (also called China Poot Lake), located on the south side of Kachemak Bay in the Southern District (Figure 9), historically was a system barren of sockeye salmon. A study initiated in 1976 determined optimum stocking levels of hatchery-produced sockeye salmon fry prior to and after lake enrichment through fertilization. Because a barrier falls downstream of the lake precludes any upstream migration and subsequent adult spawning, it is desirable to harvest all returning adult fish in the terminal harvest area, China Poot Bay. Beginning in 1988, a similar sockeye salmon stocking program was initiated at Hazel Lake, which is located approximately 3 miles south of Leisure Lake and empties into nearby Neptune Bay. Since their inception, these projects have produced over 3.0 million adult sockeye salmon, making significant contributions to the commercial, recreational, and personal use sockeye salmon harvests in the Southern District.

Because of the close proximity of the two terminal harvest areas, and the absence of a mark/recovery program, adult returns to Leisure and Hazel Lakes cannot be separately identified through sampling within the commercial catches and are therefore presented as a combined total. The cumulative total sockeye salmon return to Leisure and Hazel Lakes in 2007 was estimated to be just under 90,000 fish, or approximately two-thirds of the recent 10-year average. The cumulative commercial harvest of an estimated 83,800 fish comprised approximately 74% of the Southern District sockeye salmon harvest and almost 23% of the total LCI sockeye salmon harvest.

An estimated 2.3 million sockeye salmon fry were released into Leisure Lake in 2007 (Table 15), while 1.4 million sockeye salmon fry were stocked into Hazel Lake.

Due to a court order, the original brood source for these projects, from Tustumena Lake in Upper Cook Inlet, became unavailable to CIAA after 2004. In order to develop a new brood source, CIAA initiated a remote sockeye salmon release program from Tutka Lagoon in the Southern District, utilizing sockeye salmon eggs collected from Hidden Lake broodstock in Upper Cook Inlet. Egg collections from this location are expected to continue through 2010, after which time the adult sockeye salmon returning to the Tutka Lagoon release site will be utilized as the permanent brood source to supply not only the Leisure/Hazel Lake releases but also the Kirschner Lake sockeye salmon enhancement project in Kamishak Bay as well (see below).

Bear Lake Sockeye Salmon Enhancement

Bear Lake, located at the head of Resurrection Bay in the Eastern District (Figure 9), has been the target of sockeye salmon enhancement efforts since the late 1980's. In addition, this system has been the centerpiece of a Division of Sport Fish coho salmon enhancement program since 1962, part of which included limiting the escapement of sockeye salmon into the lake. As a result, only a small remnant run of naturally spawning sockeye salmon remained at Bear Lake until the late 1980's. In an effort to increase numbers of adult sockeye salmon without adversely affecting coho salmon production, as mandated by Alaska Board of Fisheries (BOF) policy, CIAA undertook a sockeye salmon stocking program beginning in 1989 with the release of 2.2 million sockeye salmon fingerlings. Since then, additional releases of fry, fingerlings, and accelerated growth ("zero check") smolts have occurred, ranging from 0.2 to 3.4 million juvenile sockeye salmon each year (Table 15).

Table 15.—ADF&G, CIAA, and/or CRRC salmon stocking projects and releases of salmon fry, fingerling, and smolt, in millions of fish, Lower Cook Inlet, 1987–2007.

Year	Juvenile Sockeye Salmon															
	Leisure Lake ^a	Hazel Lake ^a	Tutka Bay ^a	English Bay Lakes ^a	Port Graham Hatchery ^a	Chenik Lake	Paint River Lakes			Kirschner Lake ^a	Bruin Lake	Ursus Lake	Port Dick Lake ^a		Grouse Lake	Total Sockeye
							Upper	Lower	Elusivak							
1987	2.022	---	---	---	---	1.000	---	---	---	0.867	---	---	0.705	---	---	4.594
1988	2.100	0.783	---	---	---	2.600	1.100	0.552	0.521	0.521	---	---	0.222	---	---	8.399
1989	2.000	1.000	---	---	---	3.500	1.000	0.500	0.500	0.250	---	---	0.430	2.200	---	11.380
1990	1.750	1.250	---	0.350	---	3.250	1.000	0.500	0.500	0.250	0.500	---	---	2.400	---	11.750
1991	2.000	1.300	---	0.241	---	2.200	0.500	0.250	---	0.250	0.250	---	---	1.619	---	8.610
1992	2.000	1.000	---	0.290	---	2.750	0.500	0.250	---	0.250	0.250	0.250	---	2.370	---	9.910
1993	2.000	1.000	---	0.581	---	1.400	0.500	0.250	---	0.250	0.250	0.250	---	1.813	---	8.294
1994	0	0	---	0.800	---	0	0	0	---	0.300	0	0	---	0.170	0.570	1.327
1995	1.632	1.061	---	0	---	1.129	0.337	0.251	---	0.251	0.251	0.252	---	0.360	0.793	6.287
1996	1.490	1.030	---	0.155	---	0.951	0.500	0	---	0.250	0.250	0.250	---	0.864	0	5.657
1997	2.000	1.000	---	0.199	---	0	---	---	---	0.250	---	---	---	0.788	1.966	6.203
1998	2.005	1.302	---	0	---	---	---	---	---	0.250	---	---	---	0.265	1.288	5.610
1999	0.265	0.453	---	1.149 ^b	---	---	---	---	---	0.173	---	---	---	1.380	0	3.420
2000	1.708	1.248	---	1.006 ^c	---	---	---	---	---	0.248	---	---	---	1.794	---	6.004
2001	0.089	0	---	0	---	---	---	---	---	0	---	---	---	0.145	---	0.234
2002	2.249	1.280	---	0	---	---	0.500 ^d	---	---	0.302	---	---	---	2.407	---	6.738
2003	2.240	1.547	---	0.695	---	---	---	---	---	0.298	---	---	---	1.801	---	6.581
2004	2.002	0.351	---	0.050	0.110	---	---	---	---	0.251	---	---	---	3.012	---	5.776
2005	2.252	1.558	0.096	0.203	0	---	---	---	---	0.316	---	---	---	3.422	---	7.846
2006	0.680	0	0.255	0	0.455	---	---	---	---	0	---	---	---	3.393	---	4.750
2007	2.315	1.411	0.144	0	0	---	---	---	---	0.253	---	---	---	3.056	---	7.179
1987–2006 Avg.	1.618	0.899		0.336		1.707	0.540	0.255	0.507	0.276	0.250	0.200	0.452	1.671	0.762	6.493
1997–2006 Avg.	1.536	0.865	0.176	0.330	0.177		0.500			0.207				1.841	1.112	5.366

—continued—

Table 15.—Page 2 of 2.

Year	Juvenile Pink Salmon					Juvenile Chinook Salmon						Juvenile Coho Salmon					
	Tutka Bay Hatchery	Halibut Cove Lagoon	Homer Spit	Port Graham Hatchery ^a	Total Pink	Seldovia Bay ^a	Halibut Cove Lagoon ^a	Homer Spit		Resurrection Bay ^{a,e}	Total Chinook	Caribou Lake	Seldovia Bay ^{a,f}	Homer Spit ^a		Resurrection Bay ^{a,e}	Total Coho
								Early ^a	Late					Early	Late		
1987	20.500	3.000	0.295	---	23.795	0.084	0.094	0.104	---	0.096	0.378	0.150	0.045	---	---	0.604	0.799
1988	12.000	3.000	0.300	---	15.300	0.084	0.094	0.104	---	0.205	0.487	0.150	0.045	---	0.060	0.530	0.785
1989	30.100	6.000	0.332	---	36.432	0.108	0.115	0.104	---	0.307	0.634	0.182	0.080	---	0.143	0.339	0.744
1990	23.600	6.000	0.303	---	29.903	0.099	0.112	0.212	---	0.329	0.752	0.180	0.050	---	0.123	1.540	1.893
1991	23.600	6.000	0.303	0.255	30.158	0.091	0.092	0.191	---	0.466	0.840	0.180	0.050	---	0.100	0.599	0.929
1992	23.600	6.000	0.300	1.800	31.700	0.113	0.117	0.226	0.126	0.370	0.952	0.150	---	---	0.100	0.265	0.515
1993	43.000	6.000	---	0	49.000	0.107	0.100	0.212	0.100	0.290	0.818	0.150	---	---	0.116	0.843	1.109
1994	61.000	---	---	1.295	62.295	0.106	0.107	0.192	0.157	0.270	0.832	0.064	---	---	0.156	0.560	0.780
1995	63.000	---	---	0.358	63.358	0.113	0.036	0.228	0.124	0.315	0.816	---	---	---	0.110	0.701	0.811
1996	105.000	---	---	6.470	111.470	0.109	0.103	0.101	0.121	0.415	0.849	---	---	---	0.150	0.676	0.826
1997	89.000	---	---	0.910	89.910	0.092	0.078	0.216	0.105	0.521	1.012	---	---	---	0.120	0.807	0.927
1998	90.000	---	---	0	90.000	0.079	0.073	0.137	0.120	0.307	0.716	---	---	---	0.148	0.726	0.874
1999	60.132	---	---	4.617	64.749	0.074	0.079	0.163	0.059	0.174	0.549	---	---	---	0.137	0.529	0.666
2000	65.120	---	---	1.144	66.264	0.068	0.083	0.220	---	0.322	0.693	---	---	---	0.122	0.618	0.740
2001	99.336	---	---	27.299	126.635	0.103	0.107	0.208	---	0.228	0.646	---	---	0.125	0.100	0.681	0.906
2002	100.000	---	---	6.604	106.604	0.083	0.106	0.190	---	0.194	0.573	---	---	0.096	0.121	0.770	0.987
2003	67.967	---	---	57.158	125.125	0.108	0.107	0.206	---	0.220	0.641	---	---	0.223	0.103	0.903	1.229
2004	47.964	---	---	36.283	84.247	0.089	0.104	0.169	---	0.216	0.578	---	---	0.130	0.113	0.955	1.198
2005	---	---	---	26.568	26.568	0.115	0.113	0.221	---	0.312	0.761	---	---	0.126	0.091	1.153	1.370
2006	---	---	---	13.864	13.864	0.114	0.118	0.224	---	0.303	0.759	---	0.114	0.125	0.324	0.971	1.534
2007	---	---	---	---	---	0.054	0.055	0.227	---	0.118	0.454	---	0.097	0.127	0.101	1.022	1.347
1987–2006 Avg.	56.940	5.143	0.306	11.539	62.369	0.097	0.097	0.181	0.114	0.294	0.662	0.148	0.067	0.138	0.128	0.706	0.936
1997–2006 Avg.	77.440	---	---	17.445	79.397	0.093	0.097	0.195	0.095	0.280	0.693	---	0.114	0.138	0.138	0.811	1.043

^a Indicates currently active projects.^b Sockeye salmon release at English Bay consisted of 918,000 fry released in November 1999 and 231,000 fry held over winter for release in spring 2000.^c Sockeye salmon release at English Bay consisted of 906,000 fry released in summer 2000 and an estimated 100,000 fry held over winter for release in spring 2001.^d Fall fry (“pre-smolt”) release.^e Chinook and coho salmon releases in Resurrection Bay are each a cumulative total for all locations.^f Coho releases in Seldovia Bay were from Seldovia Lake between 1985 and 1991 and from Seldovia (Fish Creek) Reservoir beginning in 2006.

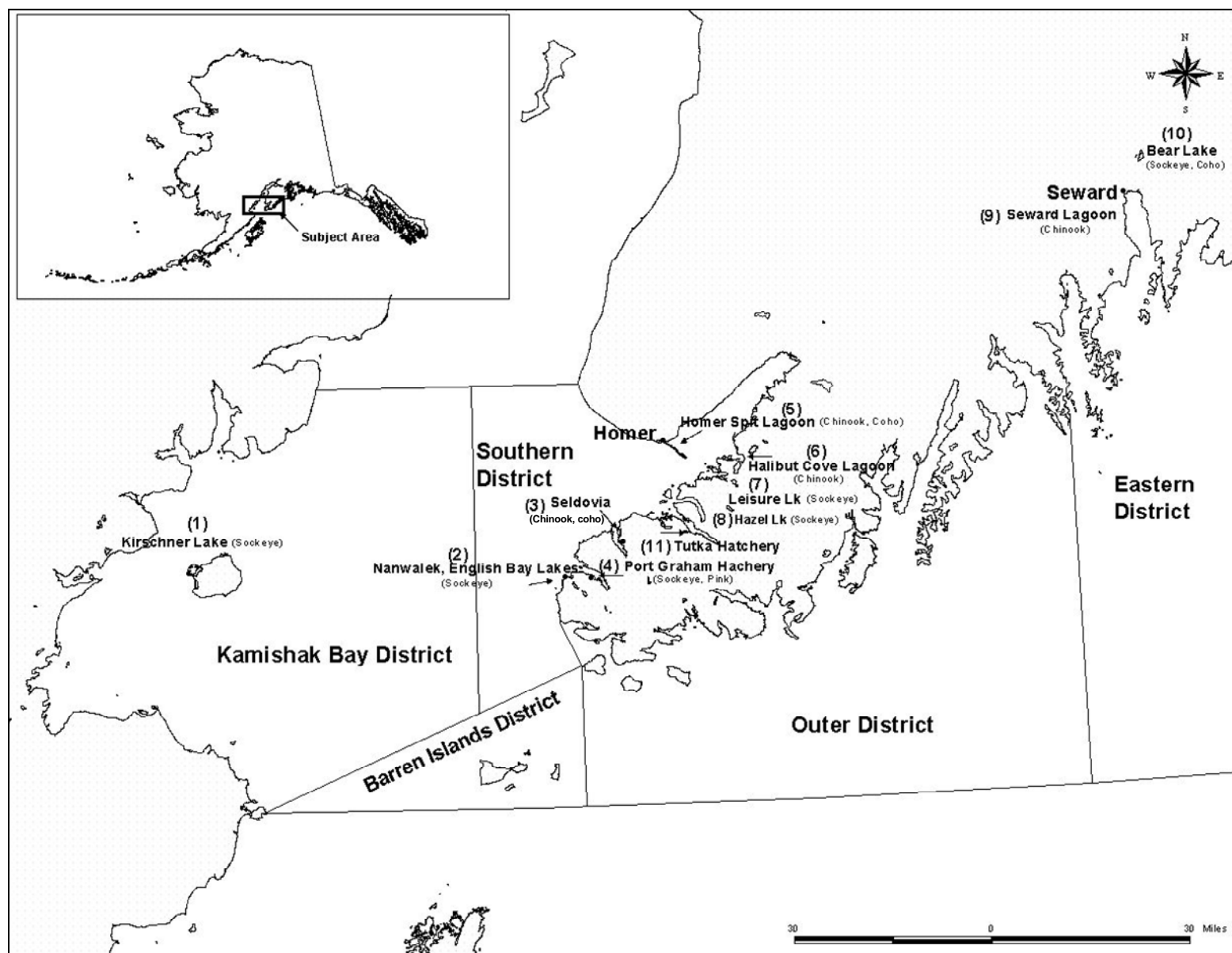


Figure 9.—Salmon hatcheries and enhancement/rehabilitation sites in Lower Cook Inlet, Alaska.

The *Bear Lake Management Plan* (5 AAC 21.375) specifies that the harvestable surplus of adult sockeye salmon returning to this site are to be equally allocated between the commercial seine user group and CIAA. The established SEG range for Bear Lake is 700–8,300 sockeye salmon, and because hatchery broodstock are collected from lake escapement, the desired inriver return in 2007 totaled 5,600–13,200 fish. Historical enhanced adult sockeye salmon returns to the lake have ranged from less than 1,000 fish to nearly 75,000 annually, with an average of about 32,000. Based on a preseason harvest forecast of 100,000 sockeyes, the return in 2007 was disappointing, totaling just over 37,000 sockeye salmon, with seiners taking about 15,400 fish, CIAA harvesting about 8,500 fish, and the remainder comprising escapement and hatchery broodstock. The program at Bear Lake has provided increased opportunity for commercial harvests in LCI, with annual seine catches ranging up to 36,000 sockeye salmon and hatchery cost recovery harvests ranging as high as 38,000 fish.

In an effort to increase sockeye salmon production in Resurrection Bay, CIAA began to increase sockeye salmon stocking at Bear Lake through fall presmolt and spring smolt releases, in addition to conventional spring/summer fry stocking. CIAA anticipates conversion of the freshwater smolt and presmolt releases into a combined saltwater smolt release program in the near future. Ultimately, CIAA estimates the cumulative juvenile sockeye salmon releases at Bear Lake and in Resurrection Bay can theoretically produce an annual return of up to 212,000 sockeye salmon adults.

Other Sockeye Salmon Lake Stocking

Kirschner Lake in the Kamishak Bay District (Figure 9) has been the site of an ongoing fry stocking project since 1987, with annual fry plantings ranging from 0.173 to 0.867 million (Table 15). Adults returning to the Kirschner Lake site are prevented from reaching the spawning grounds by a steep falls at tideline, therefore all fish are targeted for harvest by the seine fleet. Adult returns to this stocking site have averaged nearly 32,000 sockeye salmon annually, and the Kirschner Lake project has remained one of the Lower Inlet's steadiest producers of enhanced sockeye salmon despite limnological characteristics that would suggest otherwise. The estimated adult return to Kirschner Lake in 2007 exceeded 37,000 sockeye salmon, approximately 45% greater than the preseason forecast of 25,900 fish. An estimated 253,000 sockeye salmon fry were released into the lake this season.

2007 LOWER COOK INLET PERSONAL USE SALMON GILLNET FISHERY

KACHEMAK BAY FALL COHO SALMON PERSONAL USE FISHERY

The Southern District (Kachemak Bay) fall coho salmon gillnet fishery dates back prior to statehood under varying names, being known as a “personal use” fishery during the years 1986-1990, 1993, and 1995–2001, and as a “subsistence” fishery in 1991, 1992, and 1994. Numerous court rulings have affected the status of this fishery over the past 25 years, causing it to change in status between the two categories. The most recent court action, after the 1994 fishery, reestablished the “subsistence” and “non-subsistence” areas originally created by the Alaska Board of Fisheries (BOF) in 1992, and because most of Kachemak Bay was included in a “non-subsistence” area, the subsistence fishery and the regulations governing it were no longer valid. The BOF re-adopted personal use regulations governing this fishery into permanent regulation for the 1995 season and rescinded the subsistence regulations formerly governing the fishery. The personal use designation, and regulations applying to it, have remained in effect since that time.

The target species in the Kachemak Bay personal use gillnet fishery is coho salmon, with returning fish a mixture of natural stocks primarily bound for the Fox River drainage at the head of Kachemak Bay and enhanced runs destined for the Nick Dudiak Fishing Lagoon on the Homer Spit and, formerly, Fox Creek/Caribou Lake near the head of Kachemak Bay. The regulations governing the fishery are found in 5 AAC 77.549. *Personal Use Coho Salmon Fishery Management Plan*. In 1998, after hearing the staff's concerns regarding the harvest of wild stocks of coho salmon, the BOF adopted a change to the regulatory guideline harvest range (GHR) in the personal use fishery, from a former range of 2,500 to 3,500 coho salmon to a new range of 1,000 to 2,000 coho salmon. The new GHR was implemented for the first time during the 1999 season and has been in place ever since. Incorporated into the management plan is a requirement that coho salmon taken during the Seldovia area subsistence salmon fishery be included as part of the personal use guideline.

The regulatory opening date for the fishery is August 16. Legal gear is limited to a single set gillnet not exceeding 35 fathoms in length, 45 meshes in depth, and 6 inches in mesh size. Nets are not permitted more than 500 feet from the mean high water mark, and a net cannot be set offshore of another net. A permit from the Homer office is required, with an Alaska resident sport fishing license necessary to obtain the permit. The seasonal limit is 25 salmon per head of household and 10 additional salmon per each dependent. Prior to 1991, little Department management interaction occurred and the fishery often proceeded until the regulatory closing date of September 15, regardless of the harvest level. Between 1991 and 2006, years of intensive management for the GHR, fishing time allowed has ranged from 72 to 216 hours, or 1.5 to 4.5 regularly scheduled 48-hour weekly fishing periods.

Only 9 coho salmon were reported during the early August Seldovia subsistence fishery, therefore the GHR remained at 1,000 to 2,000 fish for the personal use fishery. Compared to some recent years, coho harvest rates were considered relatively slow after the season first opened in 2007. Catch information voluntarily reported after the first 48-hour fishing period indicated a catch of only 490 coho salmon, and by the end of the second 48-hour period, a total of 644 coho were reported as harvest. Cumulative catch information collected through August 25 (the end of the third fishing period) showed a total of 1,050 coho salmon harvested by 60 permit holders, representing approximately 43% of the 141 permits issued. Department staff projected that the catch would fall near the middle of the GHR by the end of the fourth fishing period. Therefore, the 2007 Personal Use Coho Salmon Fishery was closed by emergency order, effective at 6:00 a.m. Wednesday, August 29, for the remainder of the season after 192 hours of fishing time.

A total of 141 permits were issued for the 2007 fishery (Table 16), while 133 permit holders (94%) phoned in their catches or returned their permits. Of the total number issued, 95 permit holders (67%) actively fished, 38 (27%) did not fish at all, and the remaining 8 permit holders (6%) did not report or return their permit. Based on returned permits and voluntary catch reports, the harvest was estimated to be 1,431 coho salmon (Figure 10), 641 pink salmon, 113 sockeye salmon, 10 Chinook, and 34 chum (Table 16). Despite the 8 outstanding permits, these numbers are not expected to increase significantly. The coho total approaches the midpoint of the GHR of 1,000 to 2,000 fish. Contrary to recent years, the area from Fritz Creek to Swift Creek, located along the north shore of Kachemak Bay, received the majority of effort (34%) and produced the highest percentage of coho harvest (62%; Table 17) in 2007. On average between 1999 and 2006, this area received less than 10% of the active effort and produced only 10% of the overall coho catch each season. Because no tagging studies have been conducted in recent

years, it is difficult to estimate what percentage of fish taken in this area were natural stocks versus enhanced fish this season. The Division of Sport Fish conducted a mark–recapture study on the east side of the Homer Spit (only) in 2000, indicating that the majority of coho caught there were of hatchery origin from the enhancement project at the Homer Spit fishing lagoon.

Table 16.—Personal use/subsistence set gillnet salmon catches, in numbers of fish by species, and effort, Southern District, Lower Cook Inlet, 1969–2007.

Year	Permits Issued	Permits Returned		Permits Did Not		Harvest by Species						Total
		No.	%	Fish	Fished	Chinook	Sockeye	Coho	Pink	Chum	Other	
1969	47	44	93.6	35	9	0	9	752	38	0	17	816
1970	78	73	93.6	55	18	0	12	1,179	143	13	39	1,386
1971	112	95	84.8	53	42	2	16	1,549	44	7	20	1,638
1972	135	105	77.8	64	41	1	11	975	48	69	19	1,123
1973	143	128	89.5	82	46	0	18	1,304	84	40	9	1,455
1974	148	118	79.7	52	66	0	16	376	43	77	27	539
1975	292	276	94.5	221	55	4	47	1,960	632	61	95	2,799
1976	242	221	91.3	138	83	16	46	1,962	1,513	56	75	3,668
1977	197	179	90.9	137	42	12	46	2,216	639	119	84	3,116
1978	311	264	84.9	151	113	4	35	2,482	595	34	89	3,239
1979	437	401	91.8	238	163	6	37	2,118	2,251	41	130	4,583
1980	533	494	92.7	299	195	43	32	3,491	1,021	25	153 ^a	4,765
1981	384	374	97.4	274	100	25	64	4,314	732	89	100	5,324
1982	395	378	95.7	307	71	39	46	7,303	955	123	8	8,474
1983	360	328	91.1	210	118	4	21	2,525	330	40	2	2,922
1984	390	346	88.7	219	127	4	25	3,666	821	87	25	4,628
1985	316	302	95.6	205	97	5	43	3,372	166	35	3	3,624
1986	338	310	91.7	247	63	7	68	3,831	3,132	56	0	7,094
1987	361	338	93.6	249	89	5	50	3,977	279	61	0	4,372
1988	438	404	92.2	287	117	14	60	4,877	1,422	75	0	6,448
1989	466	452	97.0	332	120	41	156	7,215	882	53	49	8,396
1990	578	543	93.9	420	123	12	200	8,323	1,846	69	0	10,450
1991	472	459	97.2	295	164	8	47	4,931	366	23	0	5,375
1992	365	350	95.9	239	111	5	63	2,277	643	21	0	3,009
1993	326	317	97.2	215	102	6	44	1,992	463	18	0	2,523
1994	286	284	99.3	224	60	66	80	4,097	1,178	18	0	5,439
1995	235	232	98.7	178	54	118	108	2,916	343	7	0	3,492
1996	299	293	98.0	213	80	302	102	3,347	1,022	24	0	4,797
1997	276	264	95.7	185	79	383	191	1,814	252	12	0	2,652
1998	227	214	94.3	142	72	135	20	1,461	167	5	0	1,788
1999	146	141	96.6	111	30	276	119	1,803	168	3	0	2,369
2000	213	206	96.7	151	55	104	28	2,064	304	4	0	2,504
2001	154	148	96.1	112	34	86	27	1,579	150	16	0	1,858
2002	122	113	92.6	93	20	61	33	1,521	251	12	0	1,878
2003	104	96	92.3	72	24	17	57	1,071	170	9	0	1,324
2004	91	83	91.2	65	18	7	56	1,554	172	16	0	1,805
2005	108	96	88.9	69	27	8	57	833	296	13	0	1,207
2006	89	82	92.1	62	20	15	41	1,295	221	5	0	1,577
2007	141	133	94.3	95	38	10	113	1,431	641	34	0	2,229
1969–2006 Avg.	269	252	93.5	177	75	48	57	2,756	624	39	22	3,546
1997–2006 Avg.	153	144	94.3	106	38	109	63	1,500	216	10	0	1,897

Note: Figures after 1991 include information from both returned permits and inseason oral reports.

^a Steelhead trout *Oncorhynchus mykiss*.

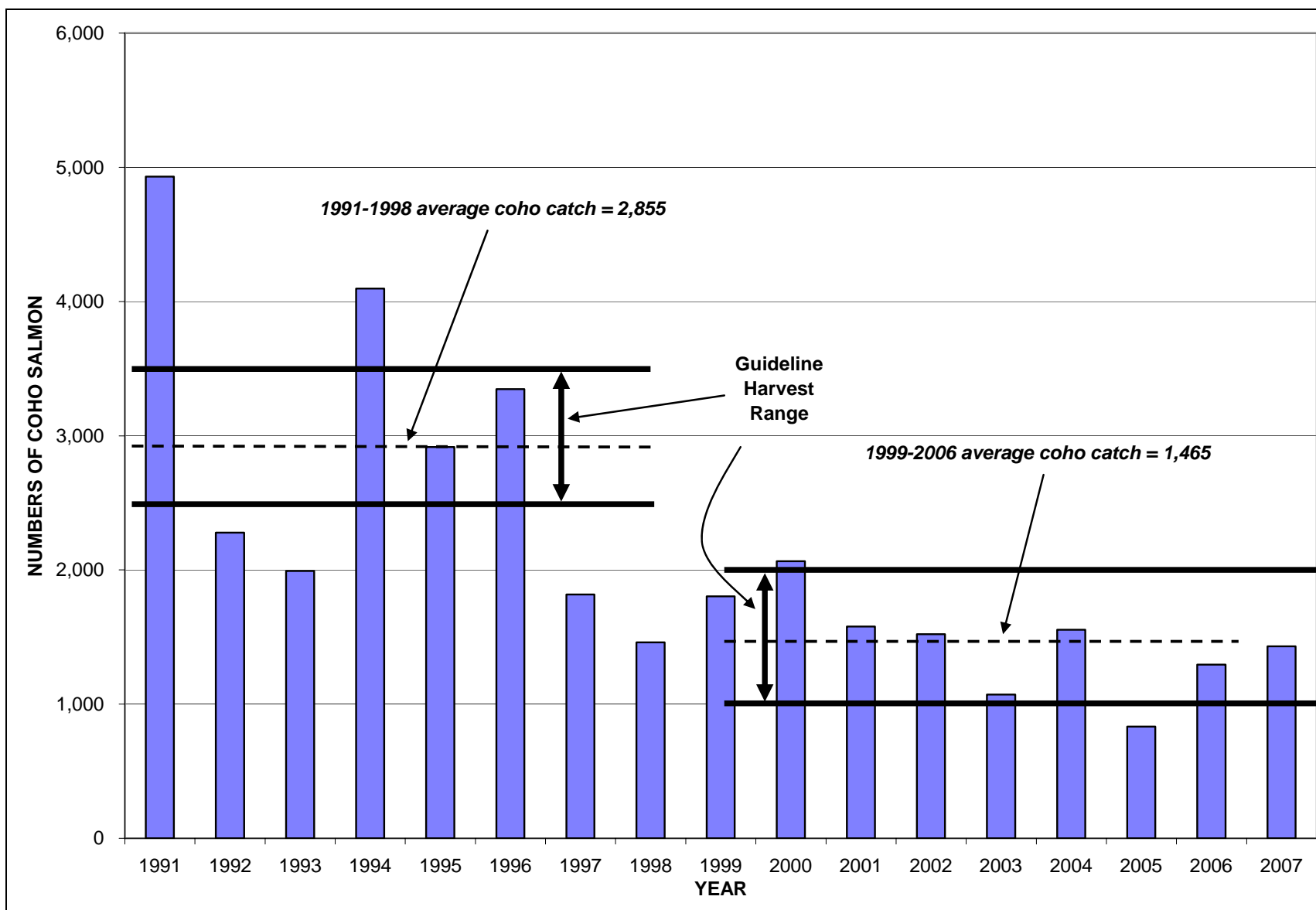


Figure 10.—Harvests of coho salmon in the Southern District (Kachemak Bay) Coho Salmon Personal Use Gillnet Fishery, Lower Cook Inlet, 1991–2007.

The duration of the 2007 Southern District personal use fishery (192 hours of fishing time) was considerably longer than the 1991–2006 average of 124 hours. While the number of permits issued this season (141) was the highest since 2001, it still fell well short of the 1991–2006 average of 220 permits. The number of actively fished permits (95) was marginally greater than the average over the past 7 years yet the highest since 2002. The increase in permits issued and actively fished this season is difficult to explain but nonetheless reverses an overall downward trend that has occurred in these parameters over the past 7 years.

The current GHR of 1,000 to 2,000 coho salmon, implemented in 1999, appears to be producing the desired results of limiting the personal use set gillnet harvest of naturally produced coho salmon in Kachemak Bay waters. Two aerial surveys of Clearwater Slough, the major coho index stream at the head of Kachemak Bay, were conducted in September to gauge escapements. The peak individual coho count of 2,900 fish, obtained on the season's first survey September 21, was considered outstanding when compared to historical survey estimates.

Based on historical information, achievement of the 2008 GHR in the personal use coho salmon fishery is anticipated.

OVERVIEW OF THE LOWER COOK INLET AREA HERRING FISHERY / STOCK STATUS

INTRODUCTION

This report reviews the history of Pacific herring *Clupea pallasii* fisheries in LCI and presents current stock status and projections for 2008. The objective of this report is to provide an overview of the status and management of Lower Cook Inlet herring resources.

Similar to the commercial salmon fishery, the LCI herring management area is divided into 5 fishing districts (Figure 1). Commercial herring fishing has historically occurred in 4 of the 5 management districts, with the Barren Islands District being the sole area devoid of commercial herring fishing. LCI herring fishing first occurred in the Southern District in 1914 with the development of a gillnet fishery within Kachemak Bay (Figure 11). During the peak of the fishery, 8 saltries, 6 near Halibut Cove, were operating. A purse seine fishery in Kachemak Bay began in 1923, but after 3 successive years of average annual harvests approaching 8,000 short tons (st; 1 short ton = 2,000 pounds), herring populations, and the fishery, collapsed.

The next LCI herring fishery began in 1939 and was centered in the Resurrection Bay and Day Harbor (just east of Resurrection Bay) areas of the Eastern District (Figure 11). Product from this purse seine fishery was used exclusively for oil and meal reduction. Although the fishery continued through 1959, peak harvests occurred from 1944 to 1946 and averaged 16,000 st each of those years. After this period, stocks sharply declined, apparently due to over-exploitation.

Table 17.—Historical catch by area in numbers of coho salmon in the Southern District (Kachemak Bay) Personal Use Coho Salmon Gillnet Fishery.

Year	East Side Homer Spit	Mud Bay To Fritz Cr.	Fritz Cr. To Swift Cr.	Troublesome Cr. To Tip Homer Spit	Bear Cove To Neptune Bay	Neptune Bay To LittleTutka	Total
1981	419	1,239	2,382	68	259	3	4,370
1982	471	3,307	3,260	118	237	5	7,398
1983	126	944	1,319	18	202	92	2,701
1984	274	1,686	1,517	25	102	35	3,639
1985	87	1,218	1,681	119	261	51	3,417
1986	490	1,415	1,651	36	166	73	3,831
1987	590	1,103	1,953	101	180	52	3,979
1988	472	1,248	2,769	78	384	56	5,007
1989	1,259	1,591	3,455	234	616	74	7,229
1990	2,117	1,748	3,478	287	465	228	8,323
1991	1,585	798	1,873	328	245	51	4,880
1992	938	464	719	37	116	18	2,292
1993	881	295	627	86	74	29	1,992
1994	1,413	596	1,558	211	314	5	4,097
1995	1,124	372	769	414	202	35	2,916
1996	1,871	364	603	220	272	17	3,347
1997	1,294	133	134	149	83	24	1,817
1998	1,062	162	39	86	75	37	1,461
1999	1,225	123	43	25	286	101	1,803
2000	1,372	169	126	210	120	67	2,064
2001	920	90	185	94	189	101	1,579
2002	624	99	195	212	201	190	1,521
2003	627	57	43	81	135	128	1,071
2004	610	131	228	75	365	145	1,554
2005	305	43	126	23	190	146	833
2006	388	179	248	20	375	85	1,295
2007	179	153	885	0	170	44	1,431
1987–2006 Avg.	1,034	488	959	149	244	79	2,953
1991–1996 Avg.	1,302	482	1,025	216	204	26	3,254
1997–2006 Avg.	843	119	137	98	202	102	1,500
1999–2006 Avg.	759	111	149	93	233	120	1,465

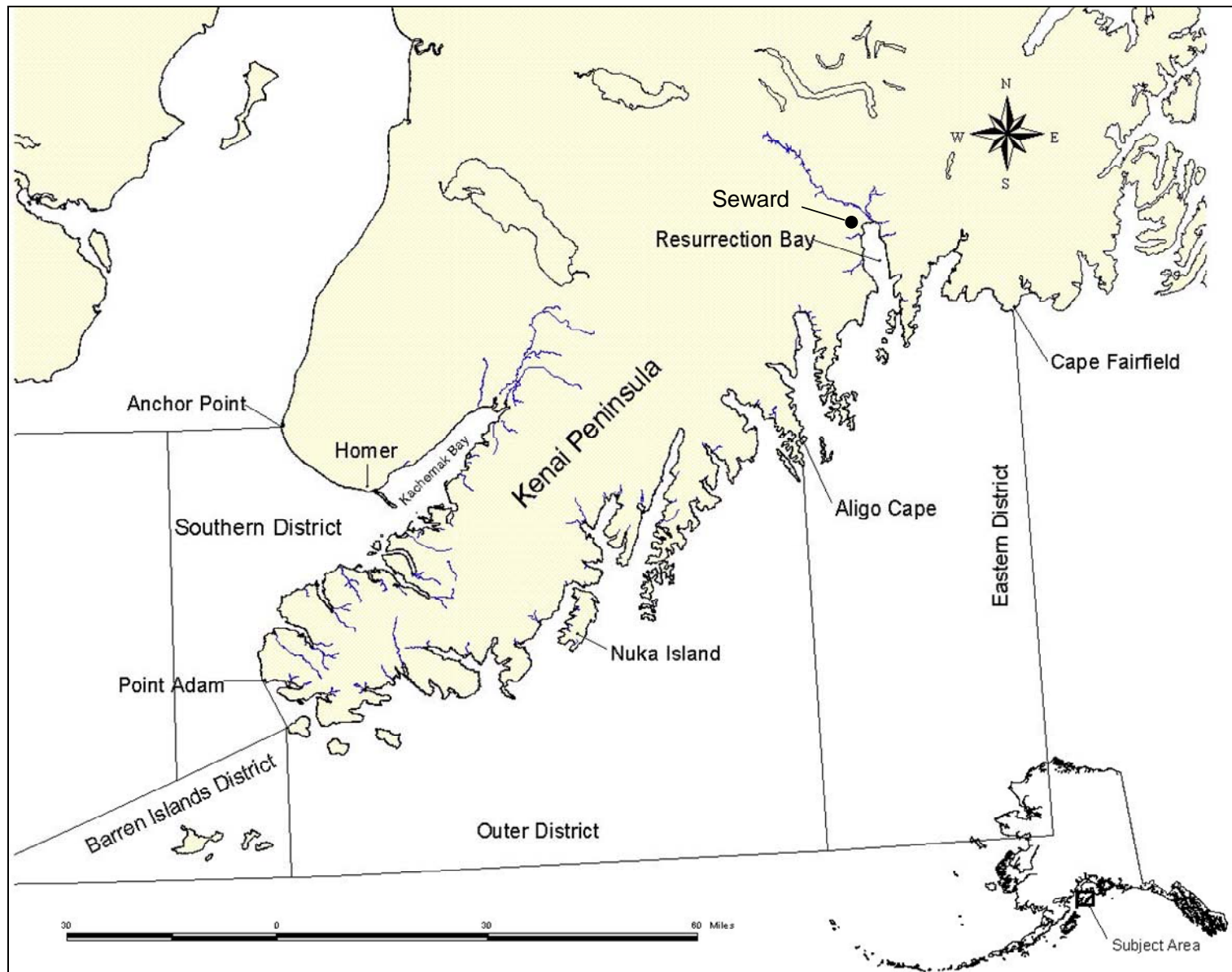


Figure 11.—Southern, Outer, and Eastern Districts of Lower Cook Inlet.

HISTORY AND DEVELOPMENT OF THE SAC ROE FISHERY

Introduction

Japanese market demand for salted herring roe resulted in the development of a sac roe fishery in the 1960s. The relatively high prices paid to fishermen caused rapid expansion of the fishing fleet and harvest, and efforts to manage the resource frequently encountered difficulty keeping pace with this strong market demand and growth. In order to decrease the risk of a stock collapse and to sustain the fishery, ADF&G established conservative management strategies and guideline harvest levels. Following a period of suspected over-exploitation, herring stocks throughout LCI generally declined after 1973. Concern over the declining trend led the Alaska Board of Fish and Game to establish a quota of 4,000 st for all of LCI prior to the start of the 1974 season.

Historically the only allowable gear type in the LCI herring sac roe fishery has been purse seine. The limited entry permit system for sac roe herring seining in Cook Inlet was implemented in 1977, and at the present time 74 permanent and 2 interim-use permits are issued for the management area.

Outer/Eastern Districts

During the early years of sac roe herring fishing in LCI, seining occurred primarily in the Outer and Eastern Districts (Figure 11), with the majority of effort and harvest once again concentrated in Resurrection Bay of the Eastern District. The first major harvest occurred in 1969, when 758 st of herring were taken in the Eastern District (Table 18). The catch increased dramatically in 1970 to a record high of 2,100 st in this district, but the stocks, and resultant harvests, declined over the next three seasons. The Alaska Board of Fish and Game allocated 1,000 st from the total LCI quota of 4,000 st to each of the Outer and Eastern Districts beginning with the 1974 season. However, stock abundance continued to decline and these quotas were never achieved. As a result, the Outer and Eastern Districts were closed to herring fishing from 1975 to 1984.

In 1985, the sac roe fishery was allowed to resume in the Outer and Eastern Districts on a very conservative basis, even though no noticeable change in spawning biomass had been observed. Because of the stocks' reduced abundance and extreme vulnerability to fishing, guideline harvest levels were set at 150 to 200 st for each of the four fishing areas created within these two districts. Fishing effort in 1985 was minimal and the majority of the harvest (216 st) once again was taken in Resurrection Bay. Only limited and sporadic harvests occurred in these two districts after 1985, with the majority of both the herring catch and the observed biomass comprised of fish age 4 and younger.

Despite considerable opportunity for exploratory fishing on a daily basis in the Outer and Eastern Districts during 1991 and 1992, the predominance of juvenile herring and the history of marginally acceptable roe recoveries from fish caught in these areas contributed to a lack of interest by fishermen and processors. These conditions prevailed from 1993 through 2001 and, consequently, the Outer and Eastern Districts were not opened to purse seining in any season during that 9-year period. At their November 2001 meeting, the Alaska Board of Fisheries closed these districts to commercial herring fishing by regulation and simultaneously adopted a management plan containing seven specific criteria that must be addressed prior to allowing any commercial herring fishing in the Outer and/or Eastern Districts. Consequently, no harvest or effort has occurred in the Outer and Eastern Districts during any recent season.

Table 18.—Catch of Pacific herring *Clupea pallasii* in short tons and effort in number of permits by district in the commercial sac roe seine fishery, Lower Cook Inlet, 1961–2007.

Year	Southern		Kamishak		Eastern		Outer		Total	
	Tons	Permits	Tons	Permits	Tons	Permits	Tons	Permits	Tons	Permits
1961	0		0		1		0		1	
1962	0		0		0		0		0	
1963	1		0		0		0		1	
1964	0		0		0		0		0	
1965	2		0		0		0		2	
1966	0		0		7		0		7	
1967	0		0		0		0		0	
1968	20		0		0		0		20	
1969	551		0		758		38		1,347	
1970	2,709		0		2,100		0		4,809	
1971	13	2	0		831	22	0	0	844	24
1972	1	1	0		30	1	0	0	31	2
1973	204	16	243	14	831	25	301	12	1,579	37
1974	110	7	2,114	26	47	5	384	26	2,655	45
1975	24	5	4,119	40					4,143	41
1976	0		4,842	66					4,842	66
1977	291	13	2,908	57					3,199	58
1978	17	7	402	44					419	44
1979	13	3	415	35					428	36
1980	---	---	---	---	---	---	---	---	---	---
1981	---	---	---	---	---	---	---	---	---	---
1982	---	---	---	---	---	---	---	---	---	---
1983	---	---	---	---	---	---	---	---	---	---
1984	---	---	---	---	---	---	---	---	---	---
1985	---	---	1,132	23	204	7	12	2	1,348	29
1986	---	---	1,959	54	167	4	28	3	2,154	57
1987	---	---	6,132	63	584	4	202	9	6,918	69
1988	---	---	5,548	75	0	0	0	0	5,548	74
1989	170	6	4,801	75	0	0	0	0	4,971	74
1990	---	---	2,264	75					2,264	75
1991	---	---	1,992	58	0	0	0	0	1,992	58
1992	---	---	2,282	56	0	0	0	0	2,282	56
1993	---	---	3,570	60	---	---	---	---	3,570	60
1994	---	---	2,167	61	---	---	---	---	2,167	61
1995	---	---	3,378	60	---	---	---	---	3,378	60
1996	---	---	2,984	62	---	---	---	---	2,984	62
1997	---	---	1,746 ^a	45 ^a	---	---	---	---	1,746	45
1998	---	---	331 ^a	20 ^a	---	---	---	---	331	20
1999	---	---	100 ^b	1 ^b	---	---	---	---	100	1
2000	---	---	---	---	---	---	---	---	---	---
2001-2007	---	---	---	---	---	---	---	---	---	---
Averages:										
1971-1980	75	7	1,671	40	435	13	171	10	2,016	39
1981-1990	170	6	3,639	61	191	3	48	3	3,867	63
1991-2000			2,061	53						
1981-2000			2,692	56	136	2	35	2	2,784	57

Source: ADF&G fish ticket database *Unpublished*.

^a Includes both commercial harvest and ADF&G test fish harvest.

^b Commercial fishery closed, ADF&G test fish harvest only.

Southern District

Sac roe herring seining in the Southern District began in the early 1960s, but catches were sporadic and relatively insignificant until 1969. That year, over 550 st were taken, followed the next season by a district record high harvest of 2,700 st. Commercial harvests continued during the 1970's, albeit at much lower levels, but observed low abundance of herring during the past 25 years has virtually precluded commercial openings in the Southern District. The only exception occurred in 1989, when 10 vessels in a single 2.5-hour opening harvested 170 st of herring (Table 18) averaging 8.9% roe recovery.

Similar to the Outer and Eastern Districts, the BOF expressed concern for the herring stock in the Southern District and responded at their November 2001 meeting by closing the Southern District to commercial fishing by regulation, including it in the previously mentioned management plan adopted for the Outer and Eastern Districts. Under the new plan, the BOF must address seven specific management considerations prior to allowing a commercial herring fishery in this district, as follows:

- 1) viability of herring stocks on a spawning area basis;
- 2) minimum spawning biomass thresholds;
- 3) abundance of mature herring for each stock;
- 4) maximum allowable exploitation rates depending on estimated stock biomass;
- 5) age class strength and sex composition;
- 6) the ecosystem function of both target and nontarget species;
- 7) maintenance of the geographic distribution of the resource.

Kamishak Bay District

Since 1973, the majority of LCI sac roe herring harvest and effort has occurred within the Kamishak Bay District (Figure 1). Historical commercial harvests ranged from a low of 243 st taken in 1973 to a high of 6,132 st taken in 1987 (Table 18), with estimated exvessel values ranging from \$70,000 to \$9.30 million. After the initial harvest in 1973, Kamishak Bay herring catches increased dramatically over the next 3 years, peaking at 4,842 st in 1976. Harvests dropped sharply during the ensuing 3 seasons, and by the end of the decade the stock had declined to a point that the Kamishak Bay fishery was closed entirely beginning with the 1980 season.

Although the Kamishak Bay District herring season remained relatively constant during the 1970's, roughly from late April through June, a significant management change occurred during this time. From 1973 through 1977, the fishery was essentially "open season until closed", but in 1978 it was changed to "closed season until opened by emergency order" (Table 19). This change required more active assessment of the herring stock by ADF&G in order to determine appropriate opening times and harvest levels.

The Kamishak Bay herring stock appeared to respond positively to the 5-year closure that began in 1980 and rebuilt rather quickly. The fishery was reopened in 1985, with a resulting harvest of 1,100 st that season. Beginning in 1985, the commercial fishery in Kamishak Bay District was regulated to achieve a 10% to 20% exploitation rate mandated by the BOF. From 1985 through 1989, harvests averaged about 3,900 st, with a peak catch of 6,132 st in 1987 (Table 18). By 1989, fishing efficiency had increased to a level where intensive regulatory management was required to maintain harvests within guideline levels, to direct the fishery at herring aggregations with high quality roe, and to protect younger age herring from harvest.

Table 19.—Summary of herring sac roe seine fishery openings and commercial harvests in the Kamishak Bay District of Lower Cook Inlet, 1969–2007.

Year	Dates of Openings	Total Hours Open	Harvest (short tons)	Catch Rate (short tons/hour open)	Number of Permits w/Landings
1969–1973	No closed periods				
1974	1/1–5/20		2,114		26
1975	1/1–6/6	(Closed Iniskin Bay 5/17)	4,119		40
1976	1/1–5/21	(Closed Iniskin Bay 5/17; reopened Kamishak 6/2) (Closed Kamishak Dist. 5/12; reopened 5/14–5/17; reopened 5/29–5/31)	4,824		66
1977	1/1–5/31		2,908		57
1978 ^a	4/16–5/31	96	402	4.2	44
1979	5/12–5/15	72	415	5.8	36
1980–1984	CLOSED	0	0		
1985	4/20–6/15	1,350 (56.2 days)	1,132	0.8	23
1986	4/20–6/13	1,303 (54.3 days)	1,959	1.5	54
1987	4/21–4/23	65	6,132	94.3	63
1988	4/22–4/29	42	5,548	132.1	74
1989	4/17–4/30	24.5	4,801	196.0	74
1990	4/22–4/23	8	2,264	283.0	75
1991	4/26	1	1,992	1,992.0	58
1992	4/24	0.5	2,282	4,564.0	56
1993	4/21	0.75	3,570	4,760.0	60
1994	4/25				
	4/29	0.5	778	1,556.0	35
		1.0	1,338	1,338.0	53
1995	4/27				
	4/28	0.5	1,685	3,370.0	45
		1.0	1,693	1,693.0	44
1996	4/24	0.5	2,984	5,968.0	62
1997	4/25 ^b	0.5	0	0	0
	4/29	1.5	1,580	1,053.3	42
	4/30	8.0	61	7.6	^c
	5/1	12.0	51	4.3	4
	5/22 ^d	^d	54	^d	---
1998	4/21	0.5	160	320.0	12
	4/22	2.0	136	68.0	11
	5/14 ^d	^d	10	^d	---
	5/22 ^d	^d	23	^d	---
1999–2007	CLOSED	0	100 ^e		

^a Management by emergency order began.

^b Despite an open fishing period, the entire fleet collectively agreed not to fish due to ongoing price negotiations with processors.

^c To comply with AS 16.05.815 CONFIDENTIAL NATURE OF CERTAIN REPORTS AND RECORDS, effort data has been masked where fewer than 4 vessels fished in a given area.

^d ADF&G test fish harvest.

^e ADF&G test fish harvest in 1999.

Management of the Kamishak Bay District between 1990 and 1997 stabilized the average harvest at roughly 40% of the 1987 record high catch. In 1993, the department began using an age-structured-assessment (ASA) model to forecast herring abundance (Table 20), in part, to mitigate the challenge of assessing herring biomass using just aerial surveys in the turbid waters of Kamishak Bay. However, hindcast biomass estimates generated by the ASA model now indicate that stocks were declining steadily throughout the decade (Table 21; Figure 12), and by 1998 the cumulative commercial herring catch in the Kamishak Bay District totaled only 331 st despite several extended district-wide openings. The fishery was closed beginning with the 1999 season due to low abundance levels and has remained closed since.

The initial Kamishak Bay District Herring Management Plan (KBDHMP) was formally adopted into regulation beginning with the 1993 season. Highlights of the original plan included a minimum biomass threshold of 8,000 st, a maximum exploitation rate of 20% (scaled depending on the forecasted biomass), and a management strategy intended to limit the harvest of herring age 5 and younger. In addition, because the spawning stock of Kamishak Bay herring is believed to reside in waters of north Shelikof Strait in the Kodiak Management Area for at least a part of the year, the KBDHMP dictated that 10% of the allowable harvest of Kamishak Bay herring be allocated to the Shelikof food/bait fishery.

At the November 2001 BOF meeting, ADF&G staff proposed amendments to the KBDHMP in order to make it more conservative. The two key components of the new plan included a reduction in the maximum exploitation rate allowed in the fishery, from a former level of 20% of the forecasted herring biomass to a new level of 15%, and a reduction in the biomass threshold (the minimum volume necessary in order to allow a fishery) from 8,000 st to 6,000 st. The staff reasoned that the decreased exploitation rate, although equating to a smaller annual harvest for the fleet, would help to preclude the extended closures that have plagued the Kamishak Bay commercial herring fishery since its inception. The new threshold level was the result of a biomass threshold analysis conducted by the LCI research staff (Hammarstrom and Otis 2001). After careful review, the BOF unanimously adopted the amended KBDHMP into regulation prior to the 2002 season.

2007 HERRING SEASON OVERVIEW

Assessment Methods

The primary method of herring biomass assessment in LCI is the aerial survey. Aerial surveys are conducted annually throughout the herring spawning season in the Kamishak Bay and Southern Districts, from late April through early June, to determine relative abundance and distribution of herring. Because a commercial herring fishery has not occurred in the Outer and Eastern Districts in many years, and is not likely to occur in the near future, aerial surveys of these areas are no longer conducted. Additionally, the size of the area and the characteristically poor weather in the Gulf of Alaska precludes surveys on a regular basis and makes aerial biomass estimation in these districts impractical and expensive. Data collection methods in the Kamishak Bay and Southern Districts are consistent between seasons, with numbers and distribution of herring schools, location and extent of spawning events and milt, and visibility factors affecting survey results recorded on index maps for each survey. Three standard conversion factors are used to estimate herring biomass based on each 538 ft² (50 m²) of school surface area sighted and the following water depth parameters: 1) 1.52 st for water depths of 16 ft or less; 2) 2.56 st for water depths between 16 and 26 ft; and 3) 2.83 st for water depths greater than 26 ft (Lebida and Whitmore 1985).

Table 20.—Preseason estimates of biomass and projected commercial sac roe seine harvests, and actual harvests, for Pacific herring *Clupea pallasii* in short tons, average roe recovery, numbers of permits making landings, and exvessel value in millions of dollars, Kamishak Bay District, Lower Cook Inlet, 1987–2007.

Year	Preseason		Actual Commercial Harvest (st) ^a	Average Roe %	No. of Permits w/Landings	Exvessel Value ^b (\$ millions)
	Forecasted Biomass (st)	Projected Harvest (st) ^a				
1981	^c	---	- CLOSED -	---	---	---
1982	^c	---	- CLOSED -	---	---	---
1983	^c	---	- CLOSED -	---	---	---
1984	^c	---	- CLOSED -	---	---	---
1985	^c	^d	1,132	11.3	23	1.00
1986	^c	^d	1,959	10.4	54	2.20
1987	^c	3,833	6,132	11.3	63	8.40
1988	^c	5,190	5,548	11.1	74	9.30
1989	37,785	5,000	4,801	9.5	74	3.50 ^e
1990	28,658	2,292	2,264	10.8	75	1.80
1991	17,256	1,554	1,992	11.3	58	1.30
1992	16,431	1,479	2,282	9.7	56	1.40
1993	28,805	2,592	3,570	10.2	60	2.20
1994	25,300	3,421	2,167	10.6	61	1.50
1995	21,998	2,970	3,378	9.8	60	4.00
1996	20,925	2,250	2,984	10.1	62	6.00 ^e
1997	25,300	3,420	1,746	9.3	45	0.40
1998	19,800	1,780	331	8.5	20	0.07
1999	^f	---	- CLOSED ^g -	---	---	---
2000	6,330	---	- CLOSED -	---	---	---
2001	11,352	---	- CLOSED -	---	---	---
2002	9,020	---	- CLOSED -	---	---	---
2003	4,771	---	- CLOSED -	---	---	---
2004	3,554	---	- CLOSED -	---	---	---
2005	3,058	---	- CLOSED -	---	---	---
2006	2,650	---	- CLOSED -	---	---	---
2007	2,286	---	- CLOSED -	---	---	---
1981–2007						
Average	15,849	2,982	2,878	10.3	56	3.08

^a Kamishak Bay allocation only, does not include Shelikof Strait food/bait allocation.

^b Exvessel values exclude any postseason retroactive adjustments (except where noted).

^c Prior to 1989, preseason forecasts of biomass were not generated.

^d Prior to 1987, preseason harvest projections were not generated.

^e Includes retroactive adjustment.

^f 1999 preseason biomass calculated as a range of 6,000 to 13,000 st.

^g ADF&G test fishing harvested 100 st.

Table 21.—Estimates of Pacific herring *Clupea pallasii* total biomass in short tons using two different methods, actual commercial sac roe seine harvest in short tons, and percent exploitation, Kamishak Bay District, Lower Cook Inlet, 1981–2007.

Year	Aerial Survey Total Biomass Estimate (st) ^a	ASA Model Total Biomass Estimate (st) ^{b,c}	Actual Commercial Harvest (st)	Estimated Exploitation Rate (%) ^b
1981	5,130	19,334	- CLOSED -	---
1982	4,835	27,588	- CLOSED -	---
1983	4,750	30,503	- CLOSED -	---
1984	6,500	29,552	- CLOSED -	---
1985	13,320	28,876	1,132	3.3
1986	26,001	26,150	1,959	8.4
1987	35,332	25,406	6,132	28.0
1988	29,548	21,526	5,548	30.7
1989	35,701	20,163	4,801	28.3
1990	19,664	17,872	2,264	14.7
1991	18,163 ^d	18,228	1,992	12.7
1992	24,077	16,071	2,282	16.5
1993	32,439	13,982	3,570	29.1
1994	25,344 ^d	11,304	2,167	21.4
1995	25,115	8,841	3,378	41.5
1996	27,640	6,047	2,984	53.9
1997	---	4,209	1,746	45.2
1998	---	3,916	331	8.7
1999	---	3,921	- CLOSED ^e -	---
2000	---	3,802	- CLOSED -	---
2001	---	3,461	- CLOSED -	---
2002	---	2,892	- CLOSED -	---
2003	---	2,555	- CLOSED -	---
2004	---	2,063	- CLOSED -	---
2005	---	1,949	- CLOSED -	---
2006	---	1,775	- CLOSED -	---
2007	---	1,864	- CLOSED -	---
1981–2007				
Average	18,459	13,538	2,878	21.8

Source: Otis *In prep a*; Otis and Cope 2004; Yuen 1994.

^a Diverse methods have been used to generate historical aerial survey biomass estimates; after 1989, see LCI herring forecast report or statewide herring forecast document to determine specific method for individual year.

^b Figures are based on the best available data at the time of publishing and are subject to change; therefore all figures herein supersede those previously reported.

^c ASA model integrates heterogeneous data sources and simultaneously minimizes differences between observed and expected return data to forecast the following year's biomass as well as hindcast previous years' biomass.

^d Due to poor aerial survey conditions, biomass was calculated from the preseason estimate of abundance, adjusted to match observed age composition samples in the commercial catch.

^e ADF&G test fishing harvested 100 st.

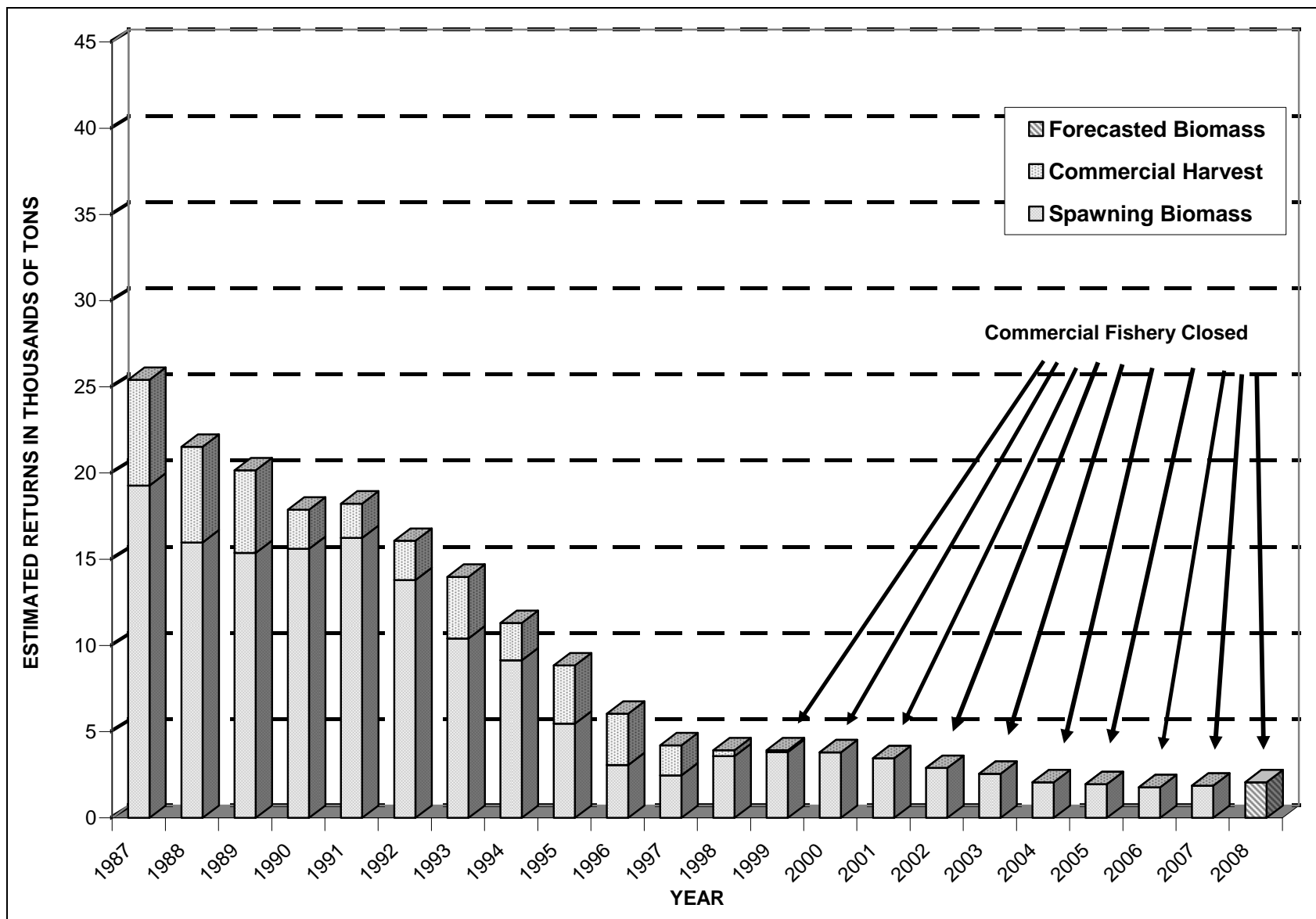


Figure 12.—Biomass estimates and commercial harvests (1987–2007) and forecasted return (2008) of Pacific herring in Kamishak Bay, Lower Cook Inlet.

Due to invariably poor weather and water clarity, aerial surveys rarely provide reliable estimates of total herring biomass returning to Kamishak District Bay waters (Otis et al. 1998). As a result, an age-structured-assessment (ASA) model has been used for the past 14 years to forecast herring abundance for Kamishak Bay, as well as to “hindcast” previous years’ total abundance. This dynamic model incorporates a variety of heterogeneous data sources including: a time series of commercial catch age composition; total run age composition; and aerial survey biomass estimates from years with adequate survey conditions and coverage. The model simultaneously minimizes the differences between expected and observed return data for each of its components, updates hindcasts of previous years’ abundance, and returns a forecasted estimate of the following year’s return.

Another tool ADF&G annually utilizes to aid in herring assessment in the Kamishak Bay District, and opportunistically in the Southern District, is a chartered commercial seine vessel. In years when no commercial fishery occurs, ADF&G is unable to utilize the fleet to collect samples for age composition analysis. By chartering a commercial purse seine vessel, samples and other related information can be collected and used to further aid in understanding the dynamics of the herring stocks. As long as sufficient funding is available, separate sampling charters are conducted to sample different portions of the spawning migration (early and late). In years when a fishery occurred (traditionally in the early part of the migration), a single “late season” sampling charter was employed to obtain a more complete picture of the overall return. Hydroacoustic observations and water temperature/depth parameters are concurrently accumulated during the charters. The information gathered during these sampling efforts provides age class data that: 1) allows the staff to generate an age composition estimate of the overall biomass observed by aerial surveyors throughout the entire duration of the spawning migration; and 2) facilitates the evaluation of the relative strength of recruiting year classes. This is critical in generating the annual herring forecast. The charters further serve to informally verify the relative magnitude of herring biomass observed by aerial surveyors.

Kamishak Bay District 2007 Season Summary

Aerial survey coverage and observation conditions to assess the Kamishak Bay herring stock in 2007 were considered fair, with several 5- to 11-day “gaps” in coverage, or periods during which no surveys were flown due to poor weather. This coverage resulted in a cumulative total of 1,237 st of herring observed by Department surveyors in the Kamishak Bay District this season, which was the second lowest volume in the past 18 years. The last 7 consecutive years of low aerial survey abundance indices indicate the lack of a significant recruitment event in Kamishak Bay during any recent season. This contrasts with nearby Kodiak area stocks, which have generally experienced population growth due to strong recruitment events in recent years.

One hypothesis for the lack of recruitment in Kamishak Bay originates from the relatively poor condition of the fish observed recently, characterized by low average weights-at-age, which can lead to higher than normal mortality. Another contributing factor may be disease. In 2007, an ongoing ADF&G-conducted disease assessment program documented *Ichthyophonus* infection rates ranging from 20–32% in herring sampled from three locations in Kamishak Bay. *Ichthyophonus* is a protozoan pathogen that has been linked to population declines of Atlantic herring. While it is uncertain what role this pathogen played, or continues to play, in the recent trend of poor recruitment and survival, its prevalence in the Kamishak stock is concomitant with the loss of older age classes (> age-8) from the population.

Relatively poor weather hindered the ability of the Department's two spring vessel charters to survey effectively and collect age composition samples during the periods 9–17 May and 21–28 May. The early sampling period coincided with the arrival of the first fish on the grounds, which was about 2 weeks later than the traditional timing of the commercial fishery. The second charter collected age composition samples during the latter portion of the return in 2007. Unfortunately, data from the two charters corroborated the overall low abundance of the population observed by Department aerial surveyors. During the 17 days spent in the district, the contracted vessel collected over 1,900 fish for age/weight/length (AWL) analysis. These AWL samples indicated that the Kamishak Bay herring population is currently comprised mainly of young, recruit aged herring (Table 22).

Using the ASA model, the department estimated the total 2007 return at 1,864 st (Tables 21 and 22; Figure 12), a 5% increase over the 2006 hindcast estimate of 1,775 st. Recruitment into the spawning population has been roughly equivalent to the loss of spawners due to natural mortality over the past several years, resulting in no major gains to the population since the stock decline leveled out around 1998 (Figure 12). The overall return this season was dominated by age-4 and age-5 herring at 19% and 16% of the population by weight, respectively (Table 22; Figure 13).

Southern District 2007 Season Summary

A total of 8 aerial surveys for herring in the Southern District were flown between May 4 and June 6 in 2007, all conducted under fair to good conditions. The 2007 run biomass, estimated as the sum of all daily biomass estimates, totaled 379 st, which was the lowest figure since 1998 when approximately 178 st were estimated. The number of surveys conducted this season continued a slightly increasing trend over the 4 to 5 flown from 2003 through 2005, yet the biomass figure for 2007 was significantly lower than the totals in any of those seasons except for 2004, when 397 st were observed. Nonetheless, the observed total in 2007 continued to follow an overall pattern of low herring abundances in the Southern District during the past 25 years. The peak 2007 individual biomass survey occurred on the next to last survey of the season, May 30, when 143 st were estimated. Peak surveys in areas where herring historically have been observed were as follows: Mallard Bay, 87 st on May 30; Glacier Spit/Halibut Cove, 20 st on May 4; west side Homer Spit, 5 st on May 22; and east side of the Homer Spit and in Mud Bay, 41 st on May 18. As has been the persistent trend over the past 25 years, low abundance levels in the Southern District, combined with the recently adopted regulatory management plan mentioned previously, precluded any commercial fishing during the 2007 season.

Outer/Eastern District 2007 Season Summary

As in previous recent seasons, no herring assessment occurred in the Outer and Eastern Districts during 2007. Unlike the Southern and Kamishak Bay Districts, historical samples from the Outer and Eastern Districts have contained up to 14% age-2 (sexually immature) herring. Formal sampling has not occurred in recent years and was very limited in previous years. However, two small, informal samples of herring from two separate schools observed aurally in Day Harbor (Eastern District, late June) and Port Dick (Outer District, early July) were obtained by handline jigging during the 2000 season. Scales were not collected for age composition analysis, but the size of all fish caught suggested that they were age-2 juveniles. No discernible shift to older age herring has ever been observed in this area, suggesting the possibility that the Outer and Eastern Districts may be feeding and rearing grounds for juvenile fish from another area.

Table 22.—Total biomass estimates and commercial catch of Pacific herring *Clupea pallasii* in short tons by age class, Kamishak Bay District, Lower Cook Inlet, 2007, and 2008 forecast.

Age	2007 Est. Spawning Biomass	Percent by Weight	2007 Commercial Harvest ^a	Percent by Weight	2007 Total Biomass	Percent by Weight	2008 Forecast Biomass	Percent by Weight
1								
2								
3	219.0	11.8%	--	--	219.0	11.8%	235.4	11.4%
4	346.5	18.6%	--	--	346.5	18.6%	382.8	18.5%
5	301.2	16.2%	--	--	301.2	16.2%	495.8	24.0%
6	265.1	14.2%	--	--	265.1	14.2%	313.7	15.2%
7	213.1	11.4%	--	--	213.1	11.4%	217.7	10.5%
8	220.9	11.9%	--	--	220.9	11.9%	146.4	7.1%
9	90.3	4.8%	--	--	90.3	4.8%	138.8	6.7%
10	71.6	3.8%	--	--	71.6	3.8%	41.8	2.0%
11	75.6	4.1%	--	--	75.6	4.1%	45.4	2.2%
12	32.7	1.8%	--	--	32.7	1.8%	32.4	1.6%
13+	27.6	1.5%	--	--	27.6	1.5%	19.0	0.9%
TOTALS	1,863.6	100.0	--	--	1,863.6	100.0	2,069.2	100.0

2008 HERRING SEASON OUTLOOK

Kamishak Bay District

The forecasted herring biomass generated by the ASA model for 2008 in the Kamishak Bay District is 2,069 st (Table 22; Figure 12; Otis *In prep a*). This total falls below the KBDHMP regulatory threshold of 6,000 st for which a commercial harvest can be considered. Additionally, over one-half of the predicted return by weight in 2008 should be comprised of fish age 5 and younger, with the single age-5 year class projected to make up nearly one-quarter of the overall return (Table 22; Figure 13). Since the KBDHMP directs ADF&G to limit the harvest of fish age 5 and younger, and because the forecasted abundance falls below threshold, the sac roe fishery in the Kamishak Bay district will remain closed for the 2008 season. The resource, and hence the commercial fishery, is best served by protecting the remaining spawning population in order to rebuild it to a harvestable level.

Without a commercial fishery in 2008, ADF&G's ability to collect age composition information will be greatly reduced. Samples will once again be obtained using a chartered commercial seine vessel throughout the duration of the 2008 run, with sufficient funding expected for both an early and a late season charter. Comprehensive aerial surveys will also be conducted throughout the spawning season, from mid-April to early June, as conditions permit.

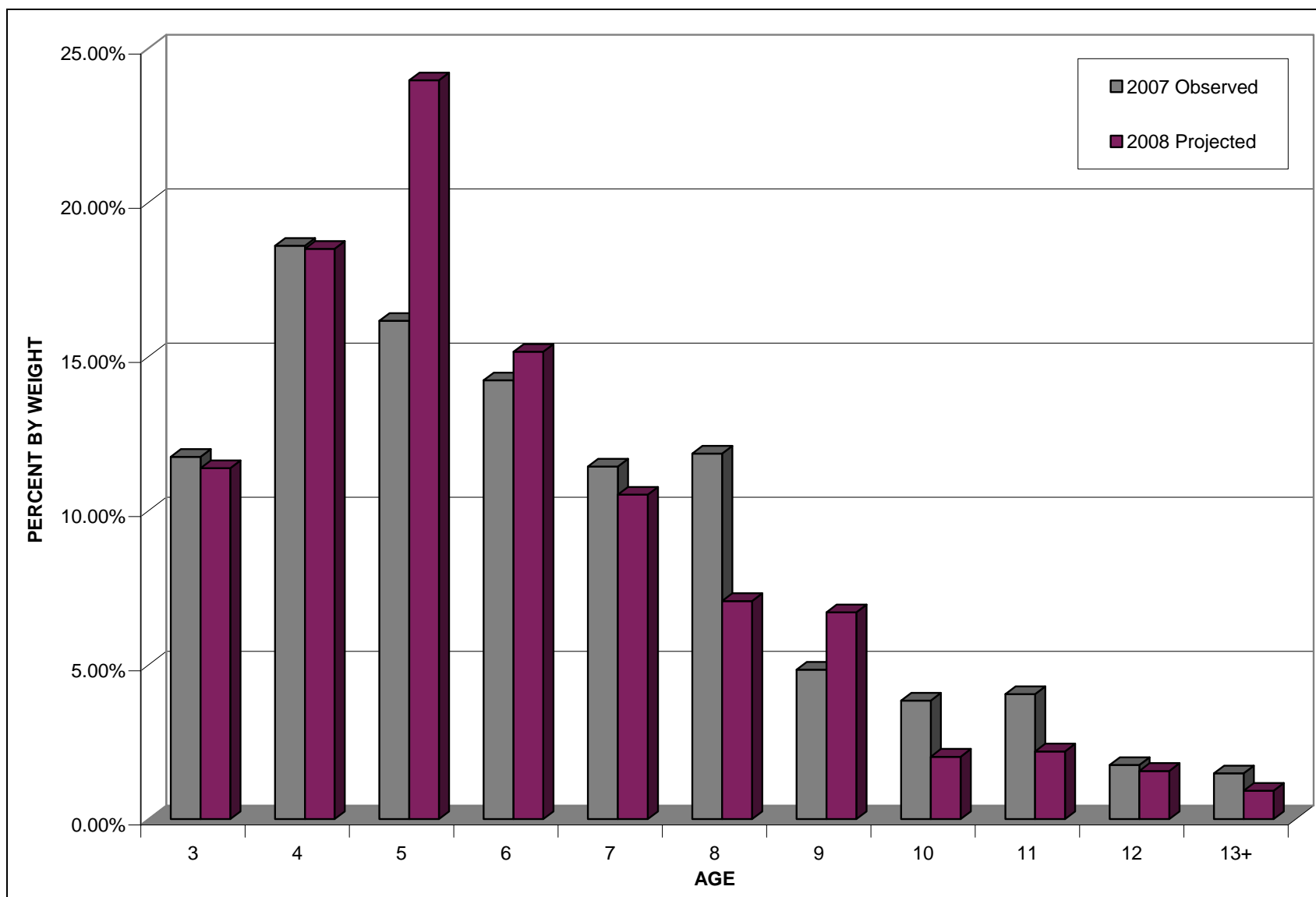


Figure 13.—Pacific herring age composition from samples collected in Kamishak Bay District, Lower Cook Inlet, 2007, and 2008 forecast.

Other Districts

Based on the persistent trend of low herring abundance in the Southern District and a historical preponderance of juvenile herring in the Outer and Eastern Districts, as well as the stipulations contained within the Eastern, Outer, and Southern Districts Management Plan, the commercial herring fishery in these areas will remain closed during 2008. Monitoring of the Southern District herring stocks will occur as in the past through the use of aerial surveys, possibly in conjunction with test fish sampling conducted on an opportunistic basis.

RECENT AND UPCOMING HERRING RESEARCH IN LOWER COOK INLET

Two additional research projects were recently completed, and another begun, to better understand Kamishak Bay herring stock structure and its relationship to other North Gulf of Alaska herring stocks. The KBDHMP dictates that 10% of the allowable harvest for Kamishak Bay be allocated to the Shelikof food/bait fishery because it appears these two stocks mix during part of the year around the north end of Shelikof Strait (Johnson et al. *Unpublished*). The extent to which these stocks intermix is poorly understood, however, and the ramifications of their mixing complicate the assessment and management of each stock. Therefore, in 2001 ADF&G successfully applied for a grant from the Exxon Valdez Oil Spill Trustee Council (EVOS-TC) to investigate the feasibility of using two relatively new stock identification techniques, fatty acid composition of heart tissue and elemental composition of otoliths, to distinguish among several Alaska herring stocks. Representative samples were collected from Sitka, Prince William Sound, Kamishak, Kodiak, and Togiak spawning aggregations during the spring of 2001. Chemical analysis of those samples was completed during 2002. Results showed that fatty acid composition of heart tissue has the potential to become a reliable stock identification biomarker. Using discriminate analysis, 157 of the 163 samples taken were correctly identified to their original herring stock. Unfortunately, stocks within the North Gulf of Alaska could not be reliably distinguished using the elemental composition of otoliths, as determined by an electron microprobe (Otis and Heintz 2003).

The second research project undertaken by ADF&G also stems from an alternative funding source. In 2002, the National Marine Fisheries Service funded an ADF&G project to synthesize all of the historical Kamishak Bay herring stock assessment and commercial fishery data into a geo-referenced database. Much of this historical information, dating back to 1973, previously existed only in hard copy form on aerial survey field maps. ADF&G captured those data into electronic maps, making them available for a variety of more in-depth analyses. Otis and Spahn (2003) reported on the results of this project, and the completed database (ADF&G *Unpublished*) is available on CD-ROM.

The latest research project is a follow-up to the promising pilot study (Otis and Heintz 2003) that demonstrated the ability to discriminate Alaska's herring stocks at relatively fine spatial scales (> 100 km) based on the fatty acid composition of heart tissue. Also funded by the EVOS-TC, this project will attempt to assess the temporal stability and biological variability of stock discrimination criteria derived from fatty acid analysis of herring cardiac tissues. Samples were collected during the spring and/or fall/winter of 2005, 2006, and 2007 from putative herring stocks from Sitka, PWS, Kamishak, Kodiak, Dutch Harbor, Togiak, and Kuskokwim Bay. Along with heart tissue for fatty acid analysis, ADF&G also collected otoliths and fin clips for further microchemistry and genetic analysis, respectively. Additional funding has been secured from the EVOS-TC to process the otolith samples using a laser-ablation, inductively-coupled

plasma mass-spectrometer (LA-ICPMS), a far more precise instrument than was used in the otolith pilot study. Chemical analysis of the heart tissues and otoliths will be completed during the winter of 2007. The results derived from each method will be compared in order to evaluate their efficacy as stock identification tools for herring. This should allow managers to better define ecologically significant stock boundaries, which would likely affect how commercially exploited herring populations are assessed and managed. The outcome of this study will be published in a peer-reviewed report and may lead to revision of fishery management plans for affected areas.

REFERENCES CITED

- ADF&G (Alaska Department of Fish and Game). *Unpublished*. Kamishak Bay Data Synthesis, Version 1.0, 13 December 2002, CD-ROM. Alaska Department of Fish and Game, Division of Commercial Fisheries, Homer.
- Hammarstrom, L. F. and E. O. Otis. 2001. Overview of the Lower Cook Inlet area commercial herring fishery and recent stock status, a report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A01-17, Anchorage.
- Johnson, B. A., C. Burkey, and D. Gaudet. *Unpublished*. Stock identification of Pacific herring in the bait fishery in Shelikof Strait, Alaska, 1985-86. 1988 report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Homer.
- Lebida, R. C., and D. C. Whitmore. 1985. Bering Sea aerial survey manual. Alaska Department of Fish and Game, Bristol Bay Data Report No. 85-2.
- Otis, E. O. *In prep* a. Forecast of the Kamishak herring stock in 2008. Alaska Department of Fish and Game, Division of Commercial Fisheries, Homer.
- Otis, E. O. *In prep* b. Lower Cook Inlet pink salmon forecast for 2008. Alaska Department of Fish and Game, Division of Commercial Fisheries, Homer.
- Otis, E. O., W. R. Bechtol, and W. A. Bucher. 1998. Coping with a challenging stock assessment situation: the Kamishak Bay sac-roe herring fishery. Pages 557-573 *In* Fishery Stock Assessment Models: Proceedings of the International Symposium on Fishery Stock Assessment Models for the 21st Century, October 8-11, 1997, Anchorage, Alaska. Editors Funk, F., T. J. Quinn, J. Heifetz, J. N. Ianelli, J. E. Powers, J. F. Schweigert, P. J. Sullivan, and C. I. Zhang. University of Alaska Sea Grant College Program AK-SG-98-01.
- Otis, E. O. and J. L. Cope. 2004. Abundance, age, sex, and size statistics for Pacific herring in Lower Cook Inlet, 2000-2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A04-04, Anchorage.
- Otis, E. O., and R. Heintz. 2003. Evaluation of two methods to discriminate Pacific herring (*Clupea pallasii*) stocks along the northern Gulf of Alaska. Exxon Valdez Oil Spill Restoration Project Final Report (Restoration Project 02538), Alaska Department of Fish and Game, Division of Commercial Fisheries, Homer.
- Otis, E. O. and M. Spahn. 2003. Improving access to ADF&G's Lower Cook Inlet Pacific herring stock assessment and commercial fishery databases, including observations of Steller sea lions. National Marine Fisheries Service, Steller Sea Lion Research Initiative Final Report (NOAA Award NA16FX1411), Alaska Department of Fish and Game, Division of Commercial Fisheries, Homer.
- Yuen, H. J. 1994. A model to predict Pacific herring age composition in early and late spawning migrations in Kamishak Bay, Alaska. Alaska Fishery Research Bulletin 1:35-54.